

THEORY AND PRACTICE OF COSTING

BY

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OF NEWMAN, BIGGS AND CO., CHARTERED ACCOUNTANTS,
BIRMINGHAM



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PREFACE

IN the Autumn of 1919 the writer delivered a course of twelve lectures to business men on the subject of "Manufacturing Costs," under the auspices of the Municipal School of Commerce, at the University, Birmingham. The lectures were repeated in the Spring of 1920, though in slightly different form, in the neighbouring town of Wolverhampton.

At both places, the lectures were the first of their kind to be delivered. There were large audiences, and the interest shown was very marked.

A general desire having been expressed that the lectures should be put into permanent form, the Author promised to see what could be done in this direction. The appearance of this book is a fulfilment of this promise, although, on account of the pressure of other duties, it is feared a somewhat belated fulfilment.

The lectures have been carefully revised and, although no new matter has been introduced, the utmost liberty has been taken in the revision.

It is hoped that the book in its present form will meet the needs of those who desire an introduction to this subject, which is of interest not only to Costing men but to all students of commercial and industrial economics.

The author wishes to express his appreciation of the services so willingly rendered by several gentlemen in reading the manuscript and the proofs. Special thanks are due to Mr. J. A. Lacey, Works Accountant to the General Electric Co., Ltd., several of whose suggestions have been gratefully incorporated in the book.

E. W. N.

BIRMINGHAM.

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THEORY AND PRACTICE OF COSTING

CHAPTER I

INCREASED Interest in Costing—Costing and War Contracts—
Relation of Costing to Business Efficiency—What is Cost?—
The Elements of Cost—The Expense of Production and the
Expense of Sale.

Increased Interest in Costing.

THE subject of Manufacturing Costs is receiving more attention from manufacturers in this country than it has ever done before. This increased attention is due to several causes. First of all, the War introduced abnormal conditions into our business life. It is unnecessary to define what these were, as they are familiar to all. Their effect was to destroy entirely the relative standards of value, which under ordinary pre-war competitive conditions were more or less constant.

These abnormal conditions made the tendering of prices in advance a matter of extreme difficulty. Buyers, therefore, had to be content to receive supplies from manufacturers at a price fixed, not at the date of the contract, but at the date of delivery.

Costing and War Contracts.

The difficulty of tendering for supplies necessary for the prosecution of the War led to the institution of Costing investigations by our Government Departments. Their object was to reimburse contractors for the expenditure incurred in the performance of Government contracts, and to limit the profit to what was considered fair and reasonable. Powers were consequently taken which

enabled the State to inspect the costs of contracts after completion, and to modify those which would not withstand the tests thus imposed.

It was inevitable that in this way very great savings were effected. Faced with such uncertain conditions, what could a manufacturer do, when requested to tender, but provide amply for contingencies which he could not accurately measure? The State, on the other hand, could not willingly pay prices tendered under conditions which in many cases would have given to the Contractor excessive remuneration.

These facts are mentioned because the powers thus assumed by the State, and the activities of investigating accountants appointed to undertake the duties incidental to the exercise of these powers, have proved a very effective stimulus to scientific Costing generally. Many manufacturers have had their attention drawn to the crudeness of their Costing methods, and have consequently realized the need for the introduction of a little more "science" into those methods.

Relation of Costing to Business Efficiency.

Another reason for the increased attention to this subject is that the ascertainment of approximately accurate Costs is directly related to business efficiency and stability. There is a general desire amongst manufacturers to abandon methods which do not promote these conditions. It is realized that competition based upon false Costs is extremely dangerous. Movements, therefore, which tend to the improvement of business in this and other directions are attracting more attention, and receiving more support, than in the past.

It is indeed surprising that the crude Costing methods practised by many manufacturers have enabled these manufacturers to survive. The explanation apparently is that these narrow traditional methods are almost

universal in particular trades—that is to say, the same mistakes are being made by practically all manufacturers in given competitive fields.

This is a condition, however, which cannot last ; it has been the ruin of particular industries in the past, and if the science of Costing is still neglected, it may be the ruin of others in the future.

It is obvious that a manufacturer who is sure of the accuracy of his Costs has much greater control over his business than one who has not this knowledge. His annual profits are not an aggregation of unknown profits and losses. He knows how they have been derived. He is therefore in a much better position to meet competition on that account : and thus knowing what part of his business is profitable and what part is not, he is able to foster trade in profitable directions, leaving unprofitable fields to others. He is also able to make any adjustment of his prices which may be desirable under stress of competition with the full knowledge of what the result of that adjustment will be.

Particular attention, therefore, is given in this book to the fundamental principles of Costing, because it is in this direction that education is generally most needed. It is useless to set up elaborate mechanism for the collection of inaccurate Costs. The mechanism is but the means to an end, and it must not be mistaken, as it often is, for the end itself. We must therefore have clearly in mind the end we wish to attain, and before devising the mechanism, make quite sure that the Costs will express faithfully and accurately for true practical purposes the actual, and not a fictitious, Cost.

What is Cost ?

The common meaning of the term " Cost " is the price paid by the purchaser to the seller for any article or service. For our purpose, however, this definition is too

general in its terms. If we resolve a manufactured article into its elements we shall see that it usually consists of a number of separate Costs.

Take for instance an iron bucket or a steel knife. The production of such articles involves first of all the recovery of iron-ore, the manufacture of iron and steel, and its conversion into suitable form for the final manufacturing processes entailed in their production. These are usually distinct and separate steps. The recovery of iron-ore, for instance, stands in a class by itself, and the cost of iron-ore includes the expense which is incidental to mining operations. The same may be said regarding the manufacture of iron and steel, and so on to the final manufacturing operations producing the completed articles.

These separate and distinct Costs are all manufacturing or production Costs. In the process of converting raw materials into manufactured articles other Costs are also involved. There are Selling and Distributing Costs; the iron-ore, for instance, has to be distributed from the iron-mines to the smelters. The smelters having produced iron and steel in various forms, the next step is the distribution of this iron and steel to manufacturers of iron and steel wares. Manufacturers of these wares have on their part to sell and distribute their products to merchants. Through the merchants the articles finally reach the consumers.

The price paid by the consumer, therefore, expresses in terms of money the sum of all the services rendered by the producers and distributors.

The whole of this Cost is, in reality, remuneration. All production is indeed ultimately resolvable into one element—labour; labour, of course, in its fullest sense, whether it be labour of head or hand. The wealth of the world is the product of man's labour, and labour is, and always has been, the stern law of his existence.

This definition of Cost will suffice for the moment. It

requires very little imagination to realise, however, that the ascertainment of the sums to be charged to the cost of separate articles in their process of manufacture and distribution involves the solution of problems of some intricacy, and it is in dealing with these problems that the full functions of Costing are seen. It has to propound and apply rules for allocating to the cost of any article the expense of its production and sale. These rules must be workable as well as equitable. They must be simple and convenient. They must also be a little pliant, as sometimes the rules which would be most equitable in theory are found impossible in practice.

The Elements of Cost.

The next step is to examine a little more closely the various elements which go to make up what is called Cost. First of all, it will perhaps be convenient to deal with the two divisions of Cost which are introduced to us in our definition of Costing—namely, the divisions of Cost into expense of production and expense of sale. This division presupposes that expense incidental to production—that is to say Manufacturing Cost—is separately ascertainable from the expense of selling the manufactured products. This all manufacturers who have experienced the full benefits of efficient Costing will endorse.

But in case some do not see the necessity for this division, let us endeavour to make it clear. If we reflect for one moment we shall all realize that most manufacturing businesses fulfil broadly two distinct functions—the function of production and the function of sale. Some manufacturing businesses, however, are solely engaged on production, the commodities produced not being products for sale. As an instance of this, we might cite the case of the Woolwich Arsenal, or the Railway Engineering Works at Crewe or Swindon or Darlington.

In these cases it is obvious that many expenses incurred

in the ordinary manufacturing business, such as Advertising, expenses of Travellers and Agents, Printing, expense of Packing and Despatching, Office Staff engaged on Records of Sales Accounts, would not be incurred.

The Expense of Production and Sale.

There are many reasons why Cost should be divided into these two elements. First of all, the expenses of Sale have no relation to the expense of Production. They are expenses with which the factory organization is not concerned, and over which it has frequently no control ; therefore, if our Costs are to be useful to those engaged in Works Administration, the expense of production should not be mingled with the expense of selling.

Another reason is that the products of a factory may consist of various classes of goods suitable for different markets, or they may be products of which the expense of warehousing may vary. It is the business of the factory to deliver to the warehouse or office door commodities at definite prices, just as in the case of a retailer who receives his supplies ready for sale.

Imagine for a moment a factory producing three distinct classes of goods suitable for the markets of South America, China, and Japan. The expense of selling in each of these markets may vary, and in order that the South American trade may not suffer from the high selling costs incidental to the trade with Japan, it becomes advisable that the selling expenses incidental to each market should be distributed by some method over the business done in that market.

Take another case. A manufacturer may, in the ordinary course of business, sell large quantities of goods to shippers in London and also small quantities, probably of different patterns, to retailers in the British Isles. The selling expense incidental to Export Trade, would usually be less, relatively, than that of his country trade ; for the

travelling expenses involved in maintaining a country connection would be greater *pro rata* than the maintenance of a connection with London shippers.

Another factor would also enter in, namely, terms of credit. A London shipper generally pays for his supplies within a month. The average length of credit given to retailers in the country would often exceed this period.

The maintenance of a country connection would therefore require a larger investment of Capital in relation to turnover, and consequently a higher rate of profit on Cost, to yield the same return upon the Capital invested.

There are still other reasons for this division, of great importance under competitive conditions. A business in addition to its ordinary sales might undertake large contracts with Government Departments. When tendering for these contracts it might be desirable to eliminate expenses incurred in travellers' or agents' commission, or advertising. A manufacturer who sees that certain of his selling expenses are not incurred in connection with certain sales is able to tender a price which under competitive conditions gives him an advantage over a manufacturer who has not this insight.

It will be clear from these factors that the segregation of the expense of selling from the expense of production is necessary and desirable.

CHAPTER II

"FACTORY" or Production Cost—Divisions of Production Cost—
(1) Material; (2) Labour; (3) Oncost—The Allocation of these
Divisions of Cost to Manufactured Articles—Approximation—
Oncost and its Relative Importance—Its Allocation to Separate
Costs—The Anatomy of Manufacturing Expense—Depreciation
and its Treatment.

"Factory" or Production Cost.

PERHAPS the most difficult problems of Costing arise in the ascertainment of purely Manufacturing Costs. These problems vary according to the nature of the manufacturing industry. It is not proposed, however, to deal with any particular industry, though we may, for purposes of illustration, look at some of the special difficulties which arise in various industries.

It should be clearly understood, however, that the fundamental principles of Costing remain the same, irrespective of the branch of industry to which they are applied, and experience of the problems in more than one industry is perhaps the best experience which a Cost Accountant could have, although probably the most difficult to obtain.

What is Factory Cost? Factory Cost is the sum of the expense solely incidental to the production of a manufactured article; or the cost of producing and placing at the office or warehouse door a manufactured article ready for sale.

Divisions of Production Cost.

The three elements into which Factory Cost may conveniently be segregated are :

- (1) Material,
 - (2) Labour,
 - (3) Oncost or Overhead or Establishment Charge.
- (1) **MATERIAL.** With regard to material, there are two

kinds which enter into the factory cost of an article. There is the direct material, that is to say, the material of which the article is made, and there are the materials used in the running of machinery, as oil, cotton waste, and mops, which, though used in the manufacture, do not form part of the article manufactured. Material of this kind is usually more conveniently treated under the item Oncost expense, because it is not easily chargeable as a direct expense in the production of one article or even group of articles.

The first element, therefore, under the term "Material" is intended to cover only the direct material of which the article is made. There are instances in which the use of material which does not enter into the constitution of the article, but is only auxiliary to the manufacturing process, may also come under the heading of direct material. These instances, however, are exceptional, and for the present need not be considered.

(2) LABOUR. The next element is that of Labour. Here again two different classes of labour, at least, enter into the production of a manufactured article. There is the direct labour of production, or the labour directly applied to a particular manufacturing operation and which can be conveniently charged to the separate products. There is also the indirect labour of production, which includes the labour of such as foremen, supervisors, men in charge of power plant, millwrights, builders and carpenters who undertake factory repairs, and others. All these may be classed under the heading of Indirect Labour, that is to say, labour not chargeable direct to any particular product, but which is part of the indirect or overhead expense of the business or of some particular department of the business.

(3) ONCOST. The next element is that which is variously described as Oncost, Overhead Charge, or Burden. This element comprises expense essential to the production of

manufactured goods, but of so general a nature that none of it can be charged to the direct cost of any particular product. Methods, therefore, have to be devised to ensure that every manufacturing operation, or, more broadly, every manufactured article, is charged its due proportion of this general expense.

Approximation in Allocating Cost to Manufactured Articles.

It will readily be gathered, therefore, that the precise ascertainment of actual Cost is a physical impossibility. Costing, indeed, resolves itself into approximation on systematic lines, so that in the process of allocation the margin of error may be reduced to the smallest possible limit.

Even in the allocation of direct material, given the simplest conditions, such as a piece of steel bar out of which some article or component is to be manufactured; although the quantity directly chargeable to the article leaves little room for contention or difference of opinion, yet the complete price to be charged in the Cost calls oftentimes for no little consideration.

As an illustration of the difficulties of approximating the quantity and value of material chargeable direct to the cost of some manufactured articles, take the conditions incidental to the production of the larger type of forgings. In the production of a large forging the manufacturer takes a steel ingot weighing perhaps 80 tons. The ascertainment of the cost of this ingot would present no exceptional difficulty. In ordering a large forging for particular purposes, however, the buyer often stipulates that the two ends of the ingot shall not be used, but that the forging shall be produced only from the middle of the ingot. The forging maker, therefore, out of his 80-ton ingot, may produce a forging weighing, say, 50 tons, and from the residue of the ingot he may produce smaller forgings

(perhaps half-a-dozen) weighing in the aggregate 10 tons.

The 80-ton steel ingot has therefore produced 60 tons of forgings, and the loss of weight in the process of manufacture has been 20 tons or 25 per cent.

How then is this loss to be distributed over the forgings? Is the purchaser of each forging to bear a share of this loss proportionate to the weight of his forging? Or is the buyer of the larger forging, who stipulated that it should only be produced out of the middle of the ingot, to bear a greater proportion of this loss in consequence? If so, what proportion?

Problems of a similar nature arise in such trades as the leather trade, where the cutting up of skins, and the consequent waste, depends on the nature and quality of the article and the uses to which the residue may be put.

One finds that problems of this nature are not always dealt with as efficiently and as carefully as they should be. Sometimes this carelessness of method is deliberate, obvious overcharges to Costs being regarded as a sort of Reserve against possible undercharges in other directions.

Sometimes, however, the effect of faulty allocation is not perceived. This brings to mind a case which came to light during an investigation into the causes of losses incurred at a bacon factory. These losses were in great measure attributable to inadequate provision for losses in weight due to removal of bone from the carcasses.

Another case was that of a brass founder who, in estimating the cost of metal in his castings, made no provision for losses in weight due to melting and pouring—that is to say, he assumed that a ton of alloy produced a ton of castings, and he had been doing this for thirty years.

• Even in the allocation of direct labour to Products, approximation takes the place of actual fact perhaps far more frequently than is generally realized. The extent of this approximation largely depends upon the methods

adopted for time-keeping and time allocations. Short stoppages of machinery, or delay occurring between the completion of one "job" and the commencement of another, may introduce margins of inaccuracy into the Costings. There are other causes also, which need not be considered now.

The Relative Importance of Oncost and its Allocation to Separate Products.

With the third element, namely, Overhead Expense or Oncost, approximation is the only possible method from an economical standpoint of distributing this expense to the cost of separate products.

It is here that the most difficult problems in Costing are met. When we bear in mind that the overhead expense is sometimes equal to the total expense of direct material and labour, we shall realize how extremely important it is to ensure its apportionment on a sound and equitable basis.

The inherent difficulties underlying the apportionment of this expense account for the fact that at this point many Costing systems break down. There are indeed many firms in this country who, though they maintain a Cost Department for the ascertainment of Prime Costs (or Direct Charges) on more or less systematic lines, make no attempt to deal seriously with the question of Oncost, contenting themselves with an all-round percentage which may bear no relation to the actual aggregate percentage of indirect expense to direct expense, as shown by their financial accounts.

Danger of Flat Percentage Rate.

It is impossible to over-emphasize the great danger of using a flat rate percentage for Oncost purposes, whether based upon the relation of the direct combined material and labour cost to indirect expense or not. Yet this is a method of distributing overhead expense which has been used and still is used very extensively by manufacturers.

Many cost clerks, after charging the direct material and labour to individual Costs, feel that in applying percentages for overhead expense they have passed from a sphere of reality into unreality. In a large number of cases it is really so. One of the main objects of this treatise is to convert these percentages, which are surrounded with so much uncertainty, into something real and tangible, and to suggest methods of allocation which will give much more accurate results than those in popular use.

These percentages, or better described, charges to Cost, should bear a strict relation to the actual expenditure which they are designed to cover. Some manufacturers do as a fact use a percentage which they consider to be suitable to their particular industry, but which has never been tested in the light of their own circumstances. It is useless for Costing purposes for a manufacturer to use somebody else's percentages, which may or may not bear some relation to his own. In such a case, a manufacturer never knows his own Costs. He may be incurring losses the causes of which can only be a matter of conjecture, or he may be making profits which severely limit his influence in the competitive markets. Such methods as these, though they may be the methods thrust upon a Costing Department, cannot really be called "Costs."

One finds also manufacturers who believe their Costing results must be necessarily right because they are linked up periodically with their financial accounts and made to agree therewith. Most text books on Cost Accounts which have been written emphasize the importance of this practice. It is urged that the final test of Manufacturing Costs is the reconciliation of the aggregate Costs with the total manufacturing expenditure for a like period.

Without in the least degree minimizing the advantages of laying the broad foundations of a Costing system within the four corners of the financial accounts of any undertaking, it should be said that the emphasis laid upon the

importance of this has tended to obscure a more important feature which should be a characteristic of all efficient Costing systems. After all, reconciliation of total costs with total expenditure as shown in the financial accounts is a comparatively simple arithmetical or accounting process, but it does not of itself in any way guarantee that the incidence of indirect cost falls where it should fall.

It does not guarantee that one product has not borne charges and expenses which would have been more correctly debited to another. The fundamental principles underlying the correct allocation of indirect cost are principles which lie outside the field of purely accounting processes.

The methods usually employed in financial accounting have served to obscure clear ideas of what constitutes Oncostr or Indirect Expense. One has only to compare the Trading and Profit and Loss Accounts of three or four manufacturing businesses engaged in the same industry to realize how fanciful and arbitrary and inadequate, as a rule, expense classifications are from a manufacturer's point of view. More will be said upon this head when we come to consider accounting methods.

But now let us attempt a classification of the indirect expense of an ordinary manufacturing business which is useful and intelligible, and will assist us when we come to discuss the various methods of allocating indirect expense to separate products. The object of this classification is to keep clearly before us the separate functions undertaken by a modern factory. The classification will throw into relief the natural lines which divide up the indirect expense, as distinct from the arbitrary lines which cut across and obscure these natural lines.

The Anatomy of Manufacturing Expense.

If we study the anatomy of manufacturing even under the most complex conditions, we shall perceive that it

consists of separate and distinct functions or services. Adopting illustrations from military life, we may compare the direct producers—that is to say, those directly engaged on manufacturing processes—with the regiments of the line, or the fighting men. These are supported by various auxiliary groups who render certain well defined services to the men of the line. There is, for instance, the medical service, the commissariat service and many others.

So it is with manufacturing activities. Direct production is supported by groups of auxiliary services supplying all that is essential to the main business of production.

There is, for instance, the provision of power, which is, of course, an indispensable auxiliary in most manufacturing businesses.

Then there is tool service, having to do with the provision and maintenance of the tools used by those engaged on direct production.

There is the maintenance of the building in which production is carried on.

There is the service of supervision and management.

These examples will no doubt be helpful in separating the various functions incidental to manufacturing, the natural divisions of which should largely govern the method of classifying indirect expense or *Oncost*.

The auxiliary services common to most businesses are few in number. They are :

- (1) Buildings expense.
- (2) Power expense.
- (3) Expense of Plant Maintenance, viz.—
 - (a) Miscellaneous supplies, such as Oil, Cotton Waste, and other materials essential to the running of the machines.
 - (b) Depreciation of Plant.
 - (c) Repairs to Plant.

- (4) Supervision.
- (5) Factory Stores.
- (6) Organization Expense.
- (7) Tool Service.

It will be necessary to elaborate somewhat the details of these separate expense classifications.

The Buildings Expense.

The buildings expense will include all charges necessary for the maintenance of the building to make it suitable for the purpose of a factory. It will therefore include Rent, Rates, Lighting, Heating, Cost of Insuring Buildings, Annual Cost of Repairs to Buildings, also cost of cleaning and painting. Where the premises are rented from a landlord on ordinary leasehold terms the annual rent paid, plus any contribution to a Sinking Fund which the terms of the lease may render necessary, such as a clause providing that the tenant shall hand over the building free from dilapidation at the end of his tenancy, will constitute the total rent charged.

Where the buildings are the property of the company or firm, or single proprietor, as the case may be, a provision should be made in the indirect expense to cover interest on capital invested in the factory land and buildings, and depreciation of the factory premises.

These two provisions will be the equivalent of the landlord's rent and will put the business proprietor who owns his business premises on the same basis as the business proprietor who rents his premises.

This, of course, is as it should be, but as a matter of fact the provision of a rent charge in the cost of a business owning its own premises is quite frequently overlooked, and to that extent the Costings for commercial purposes may be considered inaccurate.

In this connection it is well to mention that the income tax assessed on the annual value of land and buildings

under Schedule "A," commonly known as property tax, is frequently found charged as an expense. This only arises in connection with businesses the proprietors of which are also owners of the premises. It cannot, however, be considered as part of the cost of production. The income tax chargeable on land and building is in no respect different from income tax chargeable on profits.

Under this heading also it is quite convenient to include the expense of lighting, heating, and water ; not, of course, water consumed in the production of power or in the processes of manufacture.

All expense, in fact, which makes the building useful for factory purposes may be classified under this head. In this way we get a total buildings expense, which, so far as works administration is concerned, is more or less a fixed charge, and, as such, not controllable or capable of reduction. For comparative purposes the sum so ascertained is of much value.

Power Expense.

We next come to the Power expense. This may be supplied from outside sources or it may be generated by one's own plant.

Power expense will include the annual cost of gas or electric current, and depreciation and maintenance of distribution and transmission appliances.

Where power is generated by the manufacturer himself, the expense will include depreciation of the buildings containing the power-producing plant, depreciation of the plant itself, maintenance and repair, cost of fuel, stoking, labour and attendance, and possibly a charge for interest.

In this way a total charge for power-production is ascertained which may be divided by the measure of power consumed, the idea being to arrive at a figure per unit cost which may be compared with the unit cost of power supplied from an outside source.

A manufacturer who supplies his own power should put himself, for Costing purposes, on the same basis as a manufacturer who purchases his power from an outside source, so that he may see whether by supplying himself with his own power he is saving or incurring additional expense.

Stores Expense.

Under the heading of Stores is included all expense incurred in the factory stores, such as wages of store-keepers, lighting and heating of stores, maintenance of fixtures and fittings, insurance of material in stores, proportion of the building expense fairly attributable to the floor space occupied by the stores, and a proportion of the power charge in cases where power is consumed in the stores, for instance, in working a lift or elevator.

Supervision.

In the supervision charge will be included the wages and salaries of overlookers, managers, and foremen.

Organization.

The organization charge covers the services rendered by the Works Officers in management and superintendence, the recording of costs, payment of wages, design and layout of work, and the control of the progress of work through the factory.

Plant Maintenance.

Under the heading of Plant Maintenance, miscellaneous supplies present no difficulty, covering as they do oil, rags, cotton waste, and other supplies necessary in connection with the running of the plant.

Depreciation.

With regard to Depreciation of Plant, and Repairs to Plant, these are very important elements of cost, and methods of dealing with them are often unsound.

The nature of the depreciation expense is probably the cause of the elasticity in method which one finds in connection with it.

Depreciation differs from other expense in this sense, that it is an expense which a manufacturer does not regularly have to meet as he does his rent, rates, and other expenses. A manufacturer who buys a machine to-day knows that he will not be faced with further expenditure until the time comes for the machine to be replaced. When that time will come is perhaps uncertain, and as the measure of depreciation is a matter of some difficulty, and the need for provision against it not regularly felt, it is not surprising that looseness in methods of treating it are very general.

It is quite common, for instance, to find that provision for depreciation varies in proportion with the prosperity of the undertaking. In lean years, very little depreciation is provided for, while in years of plenty, one frequently finds that an excessive depreciation is written off profits.

Where a business is incurring losses in trading, provision against depreciation is frequently omitted. This custom has fostered the idea held by many commercial men that depreciation can only be allocated from profits, and that therefore if there are no profits, there can be no depreciation reserve.

One sometimes reads in reports of company meetings that no depreciation has been written off plant values, the plant having been maintained in an efficient condition out of revenue. Such a statement is of itself quite misleading.

The creation of general reserves is also frequently made through the medium of a Depreciation Account. A notable illustration of this is that of the Bank of England, the value of the premises both in the City of London and in the provinces being set down in its Balance Sheet, so it is understood, at the value of £1.

While excessive provision for depreciation may be

commended from the point of view of commercial prudence, it cannot be said to represent any particular achievement in accountancy.

From a Costing point of view, a provision which represents as nearly as possible the actual depreciation which has taken place is desirable, and nothing more nor less can safely be included if Costs are to represent as accurately as possible the actual expense incurred in manufacture.

What is Depreciation ?

Here again we meet with many confused ideas regarding the subject. Different policies are pursued by different people because so many different opinions are held as to the precise nature of the expense which the depreciation reserve is intended to provide for.

This confusion of ideas is more marked now than it ever has been. There are manufacturers who think it sound policy to discontinue provision for depreciation, at any rate on their pre-war plant, in view of the great increase which has taken place in market values.

From a Costing standpoint the question of depreciation can only be considered from one angle. Depreciation is the fall in the original value of any wasting asset due to the gradual expiration of the period in which this asset may be usefully employed for the purposes of production—or in other words, it is a provision from time to time for replacement of that part of the capital outlay, the benefit of which may be considered to have expired.

The more we examine the question the more we shall be convinced that this view is sound. Where a manufacturer purchases a machine, he incurs an expense which only differs from current expense in that it is incurred in advance. From this standpoint we realise that market values may rise and fall as much as they like without affecting the measure of this expense to the manufacturer.

Having laid down this broad principle, the difficulty of estimating the annual amount of depreciation expense still remains. It is not only the factor of gradual deterioration of plant, but the risk of obsolescence which has to be taken into account.

The factor of obsolescence in this age of engineering progress and development is of equal importance with the factor of depreciation.

It is not surprising, in view of the general looseness of ideas regarding this question, that the methods of accounting usually adopted possess the same features. One usually finds in the books of manufacturing concerns an asset account under the heading "Plant and Machinery," to which all additions to plant are charged and from which the provision made from time to time for depreciation is deducted. This deduction is usually a fixed percentage on the diminishing balance. Generally speaking, the whole of the plant and machinery is dealt with in this way, the flat percentage rate being applied to the diminishing value of machines diverse both in type and in the expectation of life attaching to each.

The result is that the balance of this account in the course of years becomes practically meaningless, a mere book value not capable of analysis except at the cost of very great labour.

Plant Register and Depreciation.

A more satisfactory way of dealing with the question of depreciation is to keep a plant register into which a description of every machine is entered together with its original cost. The life of each machine is estimated and the original cost less the probable scrap value of the machine is written off over the probable life period.

The merit of this method is that it is elastic. The constituent parts which make up the total capital value of the

plant and machinery appearing in the books of the undertaking are known, and may readily be reviewed and adjusted according to circumstances. If in the course of time it is seen that the annual charge for depreciation in the case of any particular piece of plant or separate machine is insufficient or excessive, it may be increased or reduced for future years as the circumstances require. ✓

The next question to consider is whether this depreciation should be provided for in equal annual sums or whether some other method should be adopted. There are some who favour the sinking fund method, an annual sum being set aside which, if invested at compound interest at a stated percentage, would return a sum equal to the expired capital outlay at the end of the life of the plant.

The interest yielded by the investment of such annual sums, of course, increases, and if this interest is credited against the fixed annual sum provided, the effect is that the net charge to the factory expense in respect of the depreciation of plant decreases annually.

This is by many considered to be more in accordance with the facts. While the depreciation charge decreases, the annual cost of maintaining the plant in an efficient condition increases, as the term of its useful life grows shorter.

Other authorities, however, take the view that depreciation should be measured in proportion to the annual output of the machine. Every machine is considered to have a definite output capacity during its life. This output capacity is fairly constant for a certain period and then declines so sharply that the economical use of the machine ceases. For these reasons the provision of equal periodical instalments is considered to be the most satisfactory method. It has the further merit of simplicity. The application of the sinking fund method to separate machines and separate pieces of plant having different life periods is a cumbersome process, and a method which it is difficult

to adjust with any facility to unforeseen conditions requiring an alteration of the original estimates. Its adoption is therefore not advisable except in special cases.

We have discussed this particular expense at some length because of its special nature, and because it is often one of the largest separate items entering into the total factory expense or oncost. Depreciation is really part of the factory expense. A recent examination of the Costing system in operation in a large manufacturing business showed that a system, otherwise rational, was marred by the inclusion of depreciation, not in the factory expense, but in the general administration or establishment expense.

It is curious to find such vagaries existing in Costing methods. The fact that one frequently comes across them shows the need for clearer thinking in relation to all Costing problems.

It would be possible to consider more fully the subject of depreciation, but it is necessary first of all to get a broad view of the elements of cost, avoiding detail which would tend to obscure that view.

Repairs to Plant and Machinery.

We now come to the question of repairs to plant and machinery. Broadly they may be divided into two classes: first, those which are strictly current repairs, such as the renewal of small parts; and, secondly, those repairs of a more costly nature which occur less frequently, and involve expenditure which could not be regarded as attributable wholly to the period in which such expenditure was met.

So far as the first class is concerned, these may fairly be included in the Oncost expense for the period in which they fall, and in practice it will be found that their total amount will not vary materially from year to year.

With regard to the second class of repairs, some other

method is desirable to ensure that each period bears its fair proportion. Otherwise, Costings will be subject to fluctuations which are artificial and therefore undesirable.

A practical method of overcoming this difficulty is to provide equal annual amounts based upon the average amount of this expense in past years, or, failing experience of past years, estimated on the best information available. Out of this fund all expenditure of this nature may be made and any balance carried forward from time to time.

Incidentally, the same procedure is advisable in connection with repairs to buildings. These repairs are also irregular, and require to be spread over trading periods in equal annual sums, where the total sum involved is sufficiently important.

All the elements of Cost have now been reviewed, and it is not proposed at this stage to go any further into detail, or to add to the classes of expense falling into factory oncost.

The expense of tool service will require special consideration later.

Let us endeavour to visualize the elements of cost which have been outlined. These elements are—

- (1) Direct Material,
- (2) Direct Labour,
- (3) Factory Expense.

The total of these three gives us total factory cost. To this total it is necessary to add an amount to cover general establishment or selling and distribution expense. The only factor then remaining is the factor of profit, usually added as a percentage on the total factory and selling cost.

It has been laid down clearly what is comprised in each of these divisions of total cost, except the factor of profit, which will come up for later consideration.

Let us emphasize again the desirability of making our costs as near to actual costs as conditions will allow.

In dealing with the question of factory expense, a broad view of the distinct and separate auxiliary services, classified under the general heading of factory expense or oncost, has been attempted. This classification is of considerable importance, because in the majority of cases no attempt is made to keep these several functions distinct and separate. It is a classification quite as easy as any accounting classification can be. But unlike the accounting classifications which one usually sees it has this special merit—*it observes and keeps clear the natural lines of general factory organization.*

A cost drawn up on the lines suggested, assuming that the method of allocating the indirect expense is satisfactory, is under complete control. If the management desires to know what charge has been made to any separate cost for any one of the separate services to production, it is readily ascertainable, because under the heading of factory expense is included a charge for each of these separate factors, the relation of which to the total factory expense is known.

CHAPTER III

"FACTORS" of Production—Methods of Allocating Oncost Expense—Departmental Division of Oncost—Its Importance Illustrated—Standards of Measurement for Allocating Oncost Expense—"Direct Labour" Method—Its Weakness—"Man-hour" Method—"Machine-hour" Method—Combined "Machine-hour" and "Direct Labour" Method.

IN the last chapter we considered the various elements which go to make up Cost. Attention was drawn to the fact that the ascertainment of costs resolves itself into approximation on systematic lines, so that the margin of error incidental to approximation may be reduced to the smallest possible limit.

It was pointed out also that this approximation was not confined to the part of the factory expense commonly called oncost, but that in the allocation of direct material and labour approximation entered to some extent into the reckoning, even the correct ascertainment of what is commonly known as prime cost being practically impossible.

We then endeavoured to describe what might be called the anatomy of that section of factory expenditure generally covered by the term *oncost*, showing that it was really the grouping together, under this one term, of the expense of various functions, all of which are auxiliary to the main function of production. The desirability of observing the natural lines of division in the accounting classification of this expense was also pointed out.

"FACTORS" of Production.

IN order to fix this idea firmly, it will be well to examine the table on page 27, showing not only the elements of cost, but giving also, under the term *Factory Expense*, or

Oncost, a fairly representative classification of the functions which are grouped under this head. It is, however, by no means exhaustive. The endeavour has been not to overload this table so as to make it complex, but to give sufficient detail to make it suggestive, rather than exhaustive.

CLASSIFICATION OF EXPENSE OF PRODUCTION
AND DISTRIBUTION.

1. Direct Material.	
2. Direct Labour.	
3. Factory Expense, viz.—	
(a) Building Expense	
(b) Power Expense	
(c) Plant Maintenance	
(d) „ Depreciation	
(e) Miscellaneous Supplies	
(f) Indirect Labour	
(g) Management and Supervision .	
(h) Tools	
(i) Factory Offices and Organization	
(j) Factory Stores	
4. Distribution Expense, viz.—	
(a) Selling	
(b) Delivery	
(c) General	
5. Profit	

<i>Building Expense.</i>	<i>Power Expense.</i>	<i>Repairs to Plant.</i>
Rent	Labour	Labour
Rates	Fuel	Material
Insurance	Oil	Sundries
Repairs	Rent and Rates	
Cleaning	Insurance	
Light and Heat	Water	
Miscellaneous	Repairs	
	Depreciation	
	Sundries	

It will be seen that there are certain well defined factors of production, factors comparatively few in number, all of which are essential to the business of manufacture.

For instance, the first requisite of a manufacturing

business is a factory in which the workers and the machinery may be accommodated, and the expense of providing and maintaining this accommodation, though it may be analyzed under many subsidiary headings, is capable of expression under the main heading of building expense.

In arranging the classification of expense for accountancy purposes, this should be borne clearly in mind. If workmen are engaged cleaning or heating or repairing the factory buildings, their earnings should not be classed together with the general indirect labour of the factory, but should finally come under this heading of building expense.

The generation and supply of power should be treated in the same way. Depreciation of power plant should not be included with depreciation of the producing plant and machinery, but brought under the main heading of Power Expense, as also the wages of stokers and engineers employed in connection with the power plant, fuel, oil, water, and other supplies necessary to the production of power in the power-house.

In this way, as already explained, the cost of each essential service to production is obtained in a manner well defined, capable of comparison, and in a form which facilitates examination.

It is important also to emphasize the necessity of ensuring that every factor of cost is in this way properly collected into the Schedules of Expense.

If, for instance, a manufacturer purchases his business premises and becomes his own landlord, his costs are not thereby relieved of the burden of buildings expense. The rent of his premises should not forthwith entirely disappear from his expense. It is obvious that change of landlord has very little relation to manufacturing cost, and therefore the annual rental should be replaced by a sum representing a reasonable return upon the capital invested in the factory premises.

Accurate classification of expense is of the utmost importance in Costing. From this standpoint the popular classifications of expense as shown on most annual accounts usually fall very short of the ideal.

Take, for instance, the item Depreciation. This is usually collected under one heading; but for Costing purposes it is essential to distinguish between depreciation of machinery in the factory, and the depreciation of show cases in the show-room, and of travellers' motor cars or motor delivery vans.

Comparative costs between different factories or different manufacturers are of little practical use unless the classification of oncost expense is based upon sound principles, and is more or less uniform in character.

Methods of Allocating Oncost Expense.

We now come to the most vital problem of Costing. How is the factory expense, the constituent parts of which we have briefly described, to be distributed over the output of the factory? In arriving at the cost of manufactured articles, what have we to include to cover the general factory expense incurred in the production of each?

Reference has already been made to the practice, still common, of adding to the prime cost of an article a percentage estimated to cover the total indirect expense when spread over the total output of the factory.

To illustrate this method let us take the case of a business the accounts of which show that for a stated period the direct material used in the manufacture of articles amounts to £10,000; the direct wages expended in the manufacture of these articles amount to £15,000 and the general factory or oncost expense amounts to £20,000.

It will be seen from these figures that the total prime costs of all the manufactured articles produced during the period amount to £25,000.

The total indirect expense being £20,000, an addition of

80 per cent. to the prime cost of every manufactured article will cover the amount of the indirect expense. This, of course, is very simple arithmetic, but does the application of this method to each manufactured article give us the cost of that article?

For purposes of illustration take the case of an article the cost of which is estimated as follows, viz.—

	£	s.	d.
Wages		8	-
Materials		2	-
		<hr/>	
Prime Cost	10	-	
Factory Expense 80%	8	-	
		<hr/>	
	18	-	
		<hr/>	

A little reflection regarding this article will lead to the conclusion that its material cost has very little influence upon its cost of manufacture. Seeing that the On-cost expense consists of expense such as buildings expense, power, depreciation of machinery, supervision, and tools, it is reasonable to conclude that the factory expense of manufacturing any article is governed chiefly by the number and nature of manufacturing operations to which the material is subjected.

Looking at the case of this article, the material cost of which is 2s. while the direct wages cost is 8s., we may reasonably infer that the material has been the subject of a considerable number of manufacturing processes. Each of these processes has involved the use of power. As each process takes time, time means rent, rates, light, and heat. The time of supervisors has been taken up. Possibly the article has passed in and out of the stores or view-room several times; the machinery has suffered wear and tear and depreciation.

If we invert the figures, reckoning the material cost of a second article 8s. and the direct wages cost 2s., we

see at once that a method of Costing which yields the same results in both cases is faulty. Why? Because the wages cost shows that in the first case the article was subjected to many processes of manufacture, while in the second case the bulk of the cost is in material.

Direct Wages as a Measure of Indirect Expense.

With these things in mind let us see what the relation of the indirect factory expense is to the direct wages. The total direct wages for the period amounted to £15,000 and the factory expense £20,000. The factory expense is therefore 133 per cent. of the direct labour.

Adopting the reasonable view that the factory expense is governed chiefly by the number of manufacturing operations on the material, we may draw the conclusion that to ascertain the approximate factory cost it would be better to add to the wages cost 133 per cent. to cover the factory expense, adding afterwards the direct cost of the material.

The factory cost of the first article is then estimated as follows, viz.—

	£	s.	d.
Wages		8	—
Factory Expense 133%		10	8
Material		2	—
	<hr/>		
Total	£1	—	8
	<hr/>		
	as compared with 18s., a difference of 2s. 8d.		

By the adoption, therefore, of the method of adding to the prime cost a percentage to cover overhead charges, the probable cost of this article has been under-estimated by 2s. 8d. In the case of an article costing such a small sum this is more than sufficient usually to convert a profit into a loss.

Taking now the inverted figures and reckoning the cost of the material at 8s., the cost of the direct wages 2s. and

adding 133 per cent. to the wages, we ascertain the following cost, viz.—

	£	s.	d.	
Wages		2	—	
Factory Expense 133%		2	8	
Material		8	—	
Total	£	12	8	as compared with the cost of 18s. under the first method.

This means that the supposed cost of the second article under the first method is in excess of what may reasonably be assumed a truer factory cost by 5s. 4d. or over 40 per cent.

Let us suppose a third article, the material cost of which is 4s. and the direct wages cost 6s., a total prime cost of 10s. By taking the direct wages cost of this article and adding 133 per cent. to cover the overhead charges, we arrive at a cost as follows—

	£	s.	d.
Wages		6	—
Factory Expense 133%		8	—
Material		4	—
Total	£	18	—

The same result in this case is therefore obtained from both methods. The reason of this is that the proportion of material cost to wages is equal to the proportion of total wages cost to total material cost in the accounts for the period.

It is clear from these deductions that a manufacturer who adopts the method of applying to total prime cost a uniform percentage to cover his overhead charges, is incurring serious risks himself and may also be a serious menace to other manufacturers producing the same class of articles.

Only those articles manufactured by him in which the proportions of material and labour cost are approximately equal to the proportions shown in the summary of total

expenditure, can be said to be fairly priced. Those in which the proportion of material cost is higher are priced too high, and those in which the proportion of labour cost is higher are priced too low.

Under competitive conditions there will be practically no demand for the high priced goods of this manufacturer while the easy selling lines will be those goods on the sale of which he incurs a loss.

Departmental Divisions.

There are other very important considerations which must be borne in mind in a case of this kind. Let us suppose that the figures of total expenditure, used as a basis for these simple costs, are an aggregation of the expenditure of a business in which there are several distinct departments, working under different conditions.

The following is an illustration of these conditions : A certain engineering firm had taken a number of contracts in connection with which it was agreed that the contract price should be arranged after completion of the work. A great amount of work on this basis has been undertaken during the war, not only for Government Departments but also by mutual arrangement between private contractors.

In this particular case the contracts were for the supply of certain gear which was to be manufactured at the contractors' works and installed outside. As the work was completed the contractors rendered an invoice for total material and labour expended, plus $33\frac{1}{3}$ per cent. for establishment charges, and a further percentage for profit.

In accordance with the terms of the contract, it became necessary to verify the rate adopted for establishment charges, and to arrange if possible, a reasonable percentage of profit. The manufacturers had a cost department, which, like many cost departments, was employed

exclusively in the collection of prime costs. The term "Prime Costs" is used not because it is a very happy one, but because it is a term of well understood significance. The cost department in question did not deal with the allocation of overhead charges further than to add $33\frac{1}{3}$ per cent. to prime costs in the way already described. The percentage had been used by this firm for 41 years without alteration. It was believed that it bore an approximate relation to the actual overhead charges incurred, but no actual test had been made to confirm this.

What were the conditions in which these contracts were executed? The business of this firm was divided into four distinct sections. There was a foundry producing brass castings, a machine shop, an assembling shop, and a large staff of workmen and overseers engaged on outside work.

The use of a flat rate in such circumstances as these could not possibly yield accurate results, as the conditions in each of these four departments were widely different. In the foundry, for instance, the conditions were entirely different from those in the machine shop. In the machine shop there were machines engaged in the machining of the castings which came from the foundry and of other material purchased from outside. In the assembling shop practically no machinery was used, the bulk of the work being hand labour. Regarding the outside staff, it is readily perceived that the overhead charges would be very different from the overhead charges of the machine shop, for in the outside department we have a staff of workmen using no power, occupying none of the manufacturers' floor space, and therefore incurring no rent or lighting or heating expenditure. The oncost expense attributable to this department was the cost of small tools and the cost of supervision.

An analysis of the total expense of this company for a

period covering the period in which the contracts were executed resulted in a considerable modification of the invoiced prices.

- (1) The cost per lb. of castings was separately ascertained.
- (2) The machine shop oncost proved to be considerably higher than $33\frac{1}{2}$ per cent. of the material and labour.
- (3) The oncost applicable to the outside workers proved to be less than 10 per cent. of the direct wages.

The effect of this method of Costing on the company's business may be stated thus—

- (1) In supplying manufactured articles which were the products of their factory the company always incurred a loss.
- (2) This loss was wiped off by the excessive overhead rate used in charging for the work of their outside staff.

A change in the character of the company's business such as would take place by the production of articles requiring very little outside fitting work would speedily involve the undertaking in serious loss, unless some adjustment of the Costing methods were made.

Departmental Division of Oncost.

From this illustration we may gather that it is important to departmentalize the activities of a business where the conditions in the departments are fundamentally different. Each should be treated as a distinct business. Otherwise the costs cannot reflect the actual expense incurred in the production of any article, or in the performance of any contract.

In order to emphasize the importance of departmentalization, let us imagine that the total production

expense of a business consisting of these four departments was as follows—

	<i>Total.</i>	<i>Foundry.</i>	<i>Machine Shop.</i>	<i>Assembling Shop</i>	<i>Outside Work.</i>
Direct Labour . .	£ 40,000	£ 5,000	£ 20,000	£ 5,000	£ 10,000
Oncost Expense . .	35,000	10,000	20,000	2,500	2,500
Direct Material . .	20,000	10,000	9,000	750	250
Oncost Percentage to Direct Labour .	87½%	200%	100%	50%	25%

From these figures it will be seen that the oncost percentages vary greatly in each department. Also the average oncost rate of the whole business differs from the departmental rate in every case. Work undertaken by the outside staff of workmen, for instance, should not be burdened with the average rate of oncost for the whole, viz., 87½ per cent., but only with 25 per cent., the oncost rate of this particular department.

To apply the average rate to the work of the outside workers is to overcharge very materially for this class of work. On the other hand, to use the average oncost rate in determining the cost of castings would be seriously to underestimate their cost. The same consideration also applies in the case of the productions of the machine shop.

It might be thought that, as the factory productions pass through all these departments, the average rate of oncost applied to the total direct wages expended on any product would give the same result as that secured by departmentalization. This would be so if the proportionate costs of direct labour expended on the product in each department did not vary; but they do vary. In some articles there would probably be no assembling cost; with others no outside fitting or outside work would be necessary; in others the extent of the machining would be in totally

different proportion ; while in others the castings would vary in size and value.

Importance of Departmental Division.

The necessity of departmentalizing becomes more important still in the case of orders, the execution of which only necessitates the employment of one or two of these departments.

In the case of a business consisting of the departments mentioned, it is quite possible that some of the products of each separate department are placed on sale. Castings from the foundry might be sold to outside consumers. Articles, the manufacture of which is commenced and finished in the machine shop, may form part of the sales of the business. Likewise, outside fitting or repair work may be undertaken by the outside staff involving no use of any part of the factory.

In all these cases it will be clear that if the ascertainment of an approximately true cost is desired, it is absolutely essential to treat each department separately for oncost purposes, and that approximately true costs are only obtainable if these departmental differences are recognized and taken into account.

Standards of Measurement for Allocating Oncost Expense. " Direct Labour " Method.

The method adopted so far in illustrating the allocation of oncost is what is known as the direct labour method. By this method, the amount of direct labour expended on any work is adopted as the standard of measure for the oncost. This standard is very popular in this country, no doubt because of its ease of operation and also because of its obvious advantages over the method of applying oncosts to prime costs as already explained.

It is the basis usually adopted by Government Departments in connection with contracts placed on a Costing

basis, and no doubt its adoption in this direction is also due to the fact that, in nine cases out of ten, it is the only method which the accounting arrangements of Government contractors make possible.

Weakness of "Direct Labour" Method.

This method, however, has disadvantages which it is well to recognize. Approximately true costs are only obtainable by it—

- (1) If departmentalization is resorted to.
- (2) If in each department the rate of pay received by the direct wage earners is fairly uniform.
- (3) If the cost and size and nature of the machines in each department are also fairly uniform.

If these conditions do not exist, then approximately true costs are not possible by this method.

This fact will be clearer if we examine the classification of expense set out on page 27. It will be seen from this classification that items A to E cannot be considered to bear any constant relation to direct labour.

For instance, the amount of the building expense, the basis of which is floor space, is determined by the amount of the floor space which a machine occupies, and the expense of rent in connection with that space cannot be accurately measured as a rule by the wages of the man operating the machine. The operator may be a highly skilled, highly paid man, or he may be a comparatively unskilled man employed at a low rate of wages. Whether he be one or the other, the expense of operating the machine may remain the same.

The rent, power, plant maintenance, plant depreciation, and miscellaneous supplies necessary in the running of the machine are all expenses which are determined by the size and nature of the machine and not by the rate of pay received by the operator.

The same comments may also apply to the expense

classified under the letters F and G. The cost of indirect labour and management and supervision are sometimes in inverse proportion to the rate of wages received by machine operators. Unskilled operators who may be mere attenders of practically automatic machines require as a rule more supervision and the employment of more indirect labour than a skilled workman using a very small machine entailing practically no indirect assistance or supervision.

To allocate items F and G, therefore, on the basis of direct labour will lead to incorrect Costing results, unless each class of operators, and the cost of their supervision, is treated as a separate department of the business.

Hence the necessity of departmentalizing any business so as to include similar machines and similar operators in the same class. Otherwise the allocation of oncost on the direct labour basis will be arbitrary, and will not express the conditions actually existing, or the cost actually incurred in manufacture.

"Man-hour" Method.

An alternative to the direct labour method of allocating oncost is what is known as the man-hour method. By this method some of the anomalies which arise with the direct labour method are provided against. The oncost is allocated on the basis of the numbers of hours worked by every direct wage earner. The amount of the oncost is therefore not affected by differences in rates of pay.

For this reason the man-hour method gives more correct results in cases where departmentalization on the strict lines required by the direct labour method is not possible.

The defects of the man-hour method of distributing oncost, however, are very much the same as those arising with the direct labour method. It does not take into account the difference in the size of machines. An apprentice, for instance, working on a large machine is

incurring a greater oncost charge than a skilled workman working on a smaller and less costly machine.

This defect can only be remedied by proper classification of men and machines, and the calculation of different oncost rates per hour for each class. If this is done, the results of the man-hour method are sometimes more accurate than the results under the direct labour method, because the variations in wage rates do not produce corresponding variations in the oncost allocations.

The man-hour method is also superior to the direct labour method in businesses or departments of businesses in which the use of machinery is subordinate to the use of hand labour, or where the use of hand machines is part of the manufacturing process.

" Machine-hour " Method.

The fourth method, which, particularly in an engineering establishment, is superior to other methods, is what is known as the machine-hour method. The central idea of this method is that it is the machine, and not the machine operator, which is the controlling factor of costs. This is specially the case in a highly organized manufacturing concern. In fact, in industrial circles generally, the machine tends to become the producing centre, and the workman tends to become the less important of the two factors from a Costing standpoint.

We may have, for example, groups of automatic machines which are attended by a workman at a comparatively low rate of pay, and under skilled supervision. In such a case there is substantially no direct labour cost. At any rate it is a very small part of the cost of production compared with the cost of supervision, the cost of the tool-setter, and the cost of running the machine itself.

Even in some cases where the labour employed is of a highly skilled type and the wage rate comparatively high, the type of the machine used may be so costly, and the

cost of preparing the material for the machine may also be so high that, relatively, the wages of the operator or operators form a very small part of the total cost.

Take, for instance, the case of a heavy hydraulic press used for heavy forgings. For each press or group of presses there is set apart a furnace or group of furnaces in which the ingots are heated preparatory to pressing operations. Over the presses also is a travelling crane system used for transporting the heavy ingot to the furnace, from the furnace to the press, and to remove it from the press on completion of the pressing operation.

In such conditions as these, where the direct labour cost is relatively a small proportion of what might be termed the direct manufacturing cost, adherence to the method of allocating oncost on the direct labour basis is bound to result in very wide margins of error. It therefore becomes necessary to concentrate into a machine-hour rate all the manufacturing expense directly governed by the nature of the machine, so that the utmost precision possible may be secured.

If we examine again the classification of factory expense, on page 27, the idea that a large part of the total oncost expense centres round the machine, and not the man, becomes quite clear.

The expenses under the items A to E are seen to be quite independent of the wage cost of the man operating the machine. The building expense, for instance, is more easily determined in relation to a particular machine than it is to a particular man. The building expense, as previously mentioned, consists of rent, cost of lighting and heating, and repairs and maintenance of the fabric. The total of these charges is apportionable to the respective departments of a business on the basis of the floor space taken up by each department, and the floor space of each department is then apportionable to each machine according to the space occupied by each.

A large machine, therefore, bears a greater proportion of the building expense than a small machine, which in the circumstances is only right and proper. Furthermore, this expense is not affected by any alteration of the wage rate of the operator.

The total power expense is also apportioned on the basis of the power consumed by each machine, actually ascertained, or estimated as accurately as possible, according to circumstances.

Plant maintenance is, perhaps, a little more difficult to apportion, but if it is based upon the average annual cost of machine maintenance and apportioned to the machines according to their nature, this expense is then as equitably disposed of as the conditions permit.

Where the machine is costly, the separate cost of its maintenance is often recorded through the medium of standing order numbers. These will be explained later. Plant depreciation is separately ascertainable in connection with each machine, if proper records are kept of the capital value of each, and the annual depreciation charged in each case.

Miscellaneous supplies such as oil, cotton waste, and other sundries are dealt with either from actual records of such stores supplied to each machine, or by a common-sense apportionment of the total expense under this head, according to the nature of the machine.

In relation, therefore, to expenses A to E in any case, it is possible to obtain an hourly rate expressing the total hourly burden of these separate and distinct expenses, each of which is inseparable from the machines and entirely unrelated to the wage rate of the machine operator. All these separate and distinct expenses are concentrated in the machine-hour rate.

Coming to the factory expense classified under headings F to J, it will be realized that the relation of these to the machines is not so direct and inseparable as expenses A

to E ; but the allocation of these is effected probably more equitably, if not so easily, through the machine-rate than by other methods.

Take, for instance, the item " Indirect Labour." Much of this expense may possibly be definitely attached to particular machines ; but with that part of this expense which cannot be so definitely allocated, an approximately accurate apportionment in relation to the work performed by each machine can usually be made.

The same remarks apply to management and supervision. The wages of charge hands and foremen would be definitely related to certain machines or groups of machines, while the general management expense would be distributed according to the nature of each machine and the work each performs. For instance, on some classes of machines single operations may last for several days. On that account, the supervision and management expense would, possibly, be less than with a machine upon which the character of the work was continually changing.

The organization expense, which includes wages of cost office, drawing office, progress office and others, is also distributable as equitably in relation to each machine as by any other known method, the expense under this head being either distributed equally over each machine or according to the approximate number of " jobs " completed by each machine.

Combined " Machine-hour " and " Direct Labour " Method.

Where these methods of dealing with the expense classified under the items F to J are considered unnecessarily irksome, they may be allocated on the basis of the direct labour cost, or upon the total number of hours worked by the direct wage earners.

There are many instances where this combination of the machine-hour rate and the man-hour rate might give

reasonably accurate results. By this method the machine-hour rate would be limited so as to cover only that part of the oncost expense which is inseparable from the running of the machines ; that is to say, expense under items A to E. The expense under items F to J is apportioned on the basis of the total number of man-hours divided into the total amount of this expense, giving a rate per hour to be added to the hourly rate of each machine, already determined.

It is also advisable, in order to reduce the amount of clerical work involved in the use of a separate rate for each machine, to resort to the departmentalizing of machines, grouping together machines of similar size and kind. By this means we get an average hourly rate for each class of machine.

It is, however, much better as a general rule to avoid averaging or expressing indirect charges as a percentage of any other factor where better methods are reasonably possible. In the machine-hour method, we have undoubtedly a method which reduces to a minimum the expense which it is difficult to apportion equitably over the factory output. It brings under complete control the great bulk of the factory expense, which is allocated more equitably by this method than by the other methods of distributing the oncost which have been described.

It involves, however, a great deal of initial trouble which many manufacturers hesitate to incur. Nevertheless, its advantages from an administrative standpoint are considerable. The ascertainment of machine-hour rates provides clear details of the expense incurred in operating each machine. To the machine-hour rate has only to be added the wage rate of the operator, and the total factory cost of the operation which is being performed is known as accurately as it can be known. No other method summarizes so clearly and so completely the oncost rates in relation to single operations as the machine-hour method.

Methods Reviewed.

A review of the various methods of apportioning oncost which have been enumerated shows that there is, first of all, the method of apportioning the oncost as a flat percentage rate on the total prime cost. This method yields inaccurate results in the majority of cases.

Secondly, there is the direct labour method, a method which is most popular in this country, and which is a great advance on the first method. This method, however, has certain defects, which are to some extent, though not altogether, overcome by strict departmentalization, classifying, under one head, wage earners receiving the same rate of pay, and operating the same, or practically the same, size and kind of machine.

Thirdly, there is the man-hour rate method, the accuracy of which also depends on departmentalization, and which remedies some of the defects of the direct labour method.

Fourthly, there is the machine-rate method, which has been described in some detail. This has many advantages over all other methods where machinery is involved in the processes of manufacture. It has this special merit, that it keeps clearly and distinctly before the management the hourly cost of each of the services to production in relation to each separate producing unit. This is of much benefit because it gives greater control over the expense of production than is the case with the other methods of allocating oncost.

As to which of these methods should be adopted depends upon the circumstances of the particular case.

• There are some businesses in which the adoption of the machine-hour method is the only course open in order to secure anything like accurate results. In the printing trade, for instance, where machines vary so greatly in type, the machine-hour method has, for some considerable time, been adopted almost universally. Before deciding, however, which method is most suitable in any particular

case, the manufacturer should carefully consider the conditions of his factory, and decide whether these conditions admit of fairly clear departmentalization or not.

The problem of oncost is not so important or so difficult to solve in some industries. It is sometimes possible to ascertain with more or less ease practically the total cost of production per unit of output. In the pottery trade the nature of the processes which a piece of pottery undergoes admits of the ascertainment of the cost of the most important processes per unit. That unit is the "crate" or sometimes the "saggar" unit the saggar being an earthenware box into which the pottery is placed before it goes into the oven to be fired. Each firing is a separate process, the expense of which is ascertainable with reasonable accuracy.

Into this operation is concentrated a large part of the total expense. The cost of fuel consumed at every firing is recorded, as well as the wages of the stokers, and of the men who place the ware in the oven and who unload the oven when the firing operation is completed.

The number of saggars which go into the oven is known, and the firing cost per saggar is therefore a matter of simple arithmetic. The capacity of the saggar being known in connection with any particular type of pottery-ware, the firing cost per article is thereby ascertained.

The same method is also possible in the baking and confectionery trades, and in the coal mining and iron and steel industries.

CHAPTER IV

PRACTICAL Illustrations of the Various Methods of Oncost Allocation—The Relation of Oncost to Output—Fluctuations of Output—Standard Output—Overtime—Labour and Oncost Expense Inseparable as Factors of Cost.

Illustrations of Oncost Allocation.

It is important to grasp the application of all the methods of apportioning factory expense to individual costs which have been described, and therefore illustration is necessary to show how allocation under each method is arranged. On page 48 will be found a schedule of the expense of production, outside the direct material and labour expense. The total expense, it will be seen, is £90,000.

This expense is apportioned to three imaginary departments, A, B, and C, in which the manufacturing conditions vary. In department C, for instance, it is assumed that practically no machinery is employed, the bulk of the work being hand work.

Let us also assume that the accounting system is so arranged as to facilitate the collection of the total factory expense under the separate headings shown under the letters A to J, and that we are enabled to apportion this expense to the three departments, A, B, and C. We will further assume that the factory expense covers a period of twelve months.

Under tables 2, 3, 4, and 5, on pages 48 and 49, are set out illustrations of four different methods of allocating oncost.

"Direct Labour". Method.

The first method shows the direct labour method: By this method the only information required, in addition to the details of factory expense shown under figure 1, is the

amount of the direct wages paid in each department for the same period. The total direct wages are shown to be £124,166, apportioned to the departments as follows, viz.—

A. £29,500.

B. £48,000.

C. £46,666.

The percentage of the factory expense to these figures, is, in the respective departments—

A. 200 per cent.

B. 50 per cent.

C. 15 per cent.

ILLUSTRATIONS OF ONCOST ALLOCATION.

(1) INDIRECT EXPENSE OF PRODUCTION.

	Total.	Departments :		
		A.	B.	C.
(a) Building Expense .	£12,500	£6,500	£5,000	£1,000
(b) Power Expense . .	9,500	7,000	2,350	150
(c) Plant Maintenance .	9,750	6,750	2,750	250
(d) „ Depreciation .	20,000	14,500	5,000	500
(e) Miscellaneous Supplies	3,750	3,000	500	250
	55,500	37,750	15,600	2,150
(f) Indirect Labour . .	20,850	14,850	5,000	1,000
(g) Management and Supervision . .	5,150	2,650	1,500	1,000
(h) Tool Service . . .	6,750	3,000	1,250	2,500
(i) Factory Offices . .	1,000	500	250	250
(j) „ Stores . . .	750	250	400	100
	£90,000	£59,000	£24,000	£7,000

(2) DIRECT LABOUR METHOD.

Total direct Wages in each Dept. . . .	£124,166	£29,500	£48,000	£46,666
Oncost Percentage to be applied to direct Wages of work done.	72%	200%	50%	15%

(3) MAN-HOUR METHOD

	Total.	Departments :		
No. of hours worked, viz. :		A.	B.	C.
300 days of 8 hours.	2,400	2,400	2,400	2,400
Less 10%	240	240	240	240
	2,160	2,160	2,160	2,160
No. of direct Wage- earners	1,000	250	450	300
Total No. of Man-hours.	2,160,000	540,000	972,000	648,000
Hourly Oncost Rate .	10d.	2s. 2d.	5½d	2½d.

(4) MACHINE-HOUR METHOD

No. of hours worked by Machines . . .		2,160	2,160	
No. of Machines . .		100	75	
Total No. of Machine- hours		216,000	162,000	
Hourly Machine-Rate .		5s. 6d.	3s.	

(5) COMBINED MACHINE-HOUR AND DIRECT LABOUR METHOD

No. of Hours worked by Machines . . .		2,160	2,160	
No. of Machines . .		100	75	
Total No. of Machine hours		216,000	162,000	
Hourly Machine Rate for Expenses A to E.		3s. 6d.	1s. 11d.	
Total Direct Wages .		£29,500	£48,000	
Expenses F to J . . .		£21,250	£8,400	
Oncost Rate to be ap- plied to direct Wages of Work done. . . .		72%	17.5%	

Incidentally it will be observed that the percentage of the total factory expense to the total wages is about 72 per cent., thus showing the need for departmentalization.

A cost obtained by this method would therefore consist of—

- (1) Direct labour,
- (2) Oncost (expressed as a percentage on direct labour),
- (3) Direct material,

the total so ascertained being the total factory cost.

" Man-Hour " Method.

Under Table No. 3 is illustrated the man-hour method of allocating oncost. For the purpose of this illustration, it has been assumed that the number of working days during the year was 300 days of 8 hours each, 2,400 hours in all. From this total a deduction has been made of 10 per cent. for losses due to short time on the part of individual workers, short time due to repairs to machines, and other causes. This deduction gives the total number of working hours as 2,160. The number of direct wage-earners is shown to be in department

- A. 250.
- B. 450.
- C. 300.

Multiplying the number of working hours in each department by the number of direct wage-earners, we arrive at the total number of man-hours for department—

- A. 540,000.
- B. 972,000.
- C. 648,000.

Dividing now the departmental expense by the number of man-hours we arrive at an hourly oncost rate, for department—

- A. 2s. 2d.
- B. 5½d.
- C. 2½d.

A cost obtained by this method would therefore consist of—

- (1) Labour.
- (2) Oncost (derived from the number of hours charged to the cost, calculated at the hourly rate applicable to each department).
- (3) Direct material.

Machine Hour " Method.

In Table 4 we have the machine-hour method. For this method it is assumed that departments A and B represent classifications of machines similar in type, and that the whole of the departmental expense as shown in Table No. 1 has been apportioned to the machines. The number of hours worked by each department is assumed to be 2,160, and the number of machines in department

A. 100.

B. 75.

The total number of machine hours, ascertained by multiplying the number of hours worked in each department by the number of machines, is seen to be 216,000 and 162,000. Department C is not a machine department. Dividing the departmental expense by the number of machine-hours we arrive at machine hour rates of 5s. 6d. in department A, and 3s. in department B.

A cost obtained by this method would therefore consist of—

- (1) Direct labour.
- (2) Machine oncost (derived from the number of hours in which each machine was engaged, multiplied by the hourly rate applicable to each machine).
- (3) Direct material.

Combined Direct Labour and Machine-Hour Method.

The fifth table illustrates a combined method based partly on the direct labour method, and partly on the

machine-hour method. This method is suitable in cases where the allocation to machines of expense under items F to J presents exceptional difficulties, and where it is considered that the allocation of this part of the expense on the direct labour method would yield sufficiently accurate results. Expenses A to E, as already stated, are all strictly related to machines, and therefore their aggregation under a machine-hour rate is the most satisfactory method of allocating them. Expenses F to J, however, do not bear this strict relationship to the machines, so that the method adopted for the allocation of this part of the expense should be decided in each case upon its merits.

General Considerations in Selecting Method.

In businesses where the classes of products are few, and where each class of products goes through substantially the same manufacturing operations, the direct labour basis or the man-hour basis will usually be satisfactory, bearing in mind, of course, that departmentalization of manufacturing processes is always essential.

Also, in determining which method should be adopted, the approximate relationship of overhead expense to total cost should be borne in mind. In cases where the overhead expense is a comparatively small factor, errors of allocation arising from the method would be relatively unimportant. This remark should not, however, be taken as applying to the method of allocating oncost as a percentage to prime cost, which in practically all manufacturing businesses should be definitely ruled out.

In other businesses where the overhead expense is the largest class of expense in the total cost, it is advisable to adopt a method of allocation which gives the closest approximation to actual conditions.

Indeed, where the overhead expense is equal to the prime cost, it is as unreasonable to estimate the wages and

material cost as to deal loosely with the element of oncost. The most exacting methods of ascertaining prime costs are thereby made useless through inefficient methods of dealing with the oncost.

It is important to notice that different methods of applying the oncost may be advisable in different departments of the same business.

For instance, we might have a business in which the machine-hour method would be adopted for the machine shop, where the bulk of the productive capacity of the business is situate ; while in other departments, such as the assembly, pattern-making shop, and dipping shop, in which the expenditure is relatively small, the man-hour, or direct labour method might be suitable.

Relation of Oncost to Output.

In *all* the methods of applying the oncost which we have mentioned, a third factor must be taken into consideration. Suppose we adopt the direct labour method. We immediately realize that the ratio of direct wages to overhead expense is a shifting quantity. Every week of the year this ratio fluctuates, for although the overhead expense falls more or less uniformly on each week of the year, or at any rate on each working week, the total direct wages paid weekly may be subject to considerable fluctuation. In connection with the man-hour basis also, the same fluctuation occurs in the number of weekly man-hours. How then can such uncertain standards of measurement be properly adopted ?

The same difficulties apply to the machine-hour method. The use of machines varies very much, particularly those most costly to run. A large planing machine, for instance, may only be operated for a proportion of the possible number of hours the factory is at work, the operations performed by these machines being required only intermittently. Other machines are at work the maximum number of hours in which the factory is operating.

Fluctuations of Output.

Again, working conditions are affected by variations in the demand for manufactured products.

This aspect of Costing does not always receive the attention it deserves.

It is the practice of some firms to distribute their factory expense over the factory products monthly. Let us assume that the direct labour basis is adopted, and the direct wages in the month of January amount to £1,000. The factory expense for the same month we will assume to be £1,250. For that month, therefore, an oncost rate of 125 per cent. would be added to the labour costs. In the month of February, however, the direct wages paid may rise to £1,500, and assuming the factory expense for that month to be £1,200, the oncost rate to be applied to the labour costs for February would be 80 per cent., as compared with 125 per cent. in January.

From certain points of view the Costing results obtained by this method are interesting. On the other hand, they are apt to be misleading and from many points of view useless.

All will agree, however, that they are of vital importance to the management. A manufacturer may be executing a very large contract which may engage the full capacity of his factory during its currency. For this reason the oncost rate would fall to its lowest point. On the termination of this contract the direct wages might fall, and oncost rates would for that reason rise. Would a cost arrived at in the manner just described be very useful to the manufacturer? It would not, for two or three reasons.

Consider for a moment the uses which a manufacturer may find for the costs which are prepared for him. First, he may use them as a basis for selling prices; secondly, as a basis for stocktaking values; thirdly, as an index of the efficiency of the factory management, which is an important use for them.

Bearing in mind then these three purposes, it will be

seen that costs prepared on the lines indicated only serve to obscure their usefulness for these essential objects. A manufacturer who based his selling prices on costs of a period of forced production would be fixing those prices too low, while a manufacturer who based his selling prices on the costs of a slack period of production would be fixing them too high. •

Again, stocktaking values arrived at in the same way would also either be too high or too low, and it would be a dangerous proceeding for a manufacturer to base his stock values on costs obtained in this way during a year of abnormal depression.

Further, as a guide to the efficiency of the factory management, costs which vary in this fashion are of no value whatever. A cost which if taken on the 31st October varies substantially from a cost taken on the 1st November is no index of factory efficiency, and it is plain that the fluctuation of costs so recorded is highly artificial.

Suppose a change in manufacturing method is contemplated which reduces the direct labour cost. In such a case the oncost rate would increase relatively to the reduction in the direct labour. Here then we should obtain a total cost which ought to show an actual reduction on costs obtained before the change in method was made. If, however, costs are prepared on the lines already described, what basis have we for comparing our new costs with previous costs?

Costs prepared on such a basis can have no comparative value from this standpoint.

• Standard Output.

How then are we to distribute the factory expense? There is only one method which appears to answer all the requirements which may reasonably be demanded of a Costing system. This method entails the ascertainment of a standard of oncost for a period sufficiently long to

include the normal fluctuations of a manufacturing business.

Having ascertained what this standard burden is, we may regard it as the cost of the unused or potential capacity of the factory, to be distributed over the output in strict proportion to the amount of direct labour for any period, or to the number of man or machine-hours, as the case may be.

In this way, costs will not be affected by trade fluctuations due to circumstances beyond the control of the manufacturer. The factory expense will be allocated to the factory production for any period in the strict proportion which the output for that period bears to the standard output ; whether the output be measured by the amount of direct labour, or in man or machine-hours.

Take an illustration to make this clear. Suppose after investigation in the light of past experience and present circumstances we finally fix the annual oncost at £12,000, that is, £1,000 per month. Suppose also that the direct labour method is the basis of the costs, and that the total oncost is equivalent to 100 per cent. of the labour. If the direct wages therefore amounted to £1,000 per month they would be exactly equal to the monthly oncost charge. This, of course, would not happen in practice. Fluctuations in the monthly wages totals are inevitable.

If the direct wages for the first month were £800, however, we should still reckon the oncost charge as 100 per cent. of this amount, viz., £800, leaving £200 of the monthly oncost undistributed.

If the direct labour during the second month amounted to £1,100, we should distribute £1,100 of factory expense ; and likewise for the full period in respect of which the total oncost charge has been estimated.

If then, notwithstanding the fluctuations in the monthly wage payments, the total wages for the year amount to £12,000, we shall have distributed the whole oncost

charge for the same period in strict proportion to the wages paid from month to month.

Costs ascertained in this manner will therefore be what might be termed normal costs, from which the effect of fluctuations due to conditions beyond the control of the manufacturer are eliminated. This normal cost is then reliable for the purposes of fixing selling prices, as a basis for stocktaking valuations, and also forms an index to factory efficiency.

Briefly then, the rule for allocating oncost may be stated thus—

The amount of oncost distributable for any period is determined by the proportion which the direct wages paid during that period bears to the total wages paid during the standard period ; or in cases where the man-hour or machine-hour method is the basis, the proportion which the total man-hours, or total machine-hours, bears to the total man-hours or machine-hours of the standard period.

It may be thought that this method prevents the ascertainment of actual costs at any time. This, however, is only apparently so, for the accounting method adopted for the distribution of burden would show for any week or month or other period the amount of the actual Overhead Expense undistributed when production was below the normal, and the amount of excess burden distributed in periods where production was above the normal.

In arriving at the normal capacity of the factory, the basis will, in most cases, be the experience of the business in previous periods, modified by any changes known to the management.

Lost Time.

In estimating the total number of man-hours or machine-hours for the purpose of fixing hourly oncost rates, certain deductions will have to be made from the total number of possible working hours, to cover losses of time which

inevitably take place. In the first place there are the deductions due to the holidays observed in the course of a year. In addition to this loss of time, there is the loss of a few days annually, possibly, for stocktaking. Then there is short time made by workers.

There are also the losses which occur from other causes, such as the execution of repairs to machinery, and sometimes through delay in getting material. All these factors should be provided against, and a slight reserve made for losses of time due to other causes, the effect of which it would be difficult to estimate with any precision.

In most factories there are machines the use of which is not regular. In these cases the estimated number of hours, even when based upon previous experience, will possibly prove to be inaccurate. The hours worked by these machines should be carefully watched during the period, and if it is found that the estimate is likely to be inaccurate, adjustments of the machine rates should be made.

Loss of time due to causes which cannot be foreseen should not be provided for by a deduction from the total hours. Amongst these losses may be reckoned losses due to strikes or total breakdown of power, plant, or fire. These are losses which should appear in the Accounts for the period as undistributed factory expense. They should be written off through the general Profit and Loss Account of the business.

Overtime.

An excessive amount of overtime, or the introduction of a night-shift, will affect the basis of the man-hour or machine-hour rates.

In the case of a night-shift, its introduction would involve revision of the factory expense, so that the day-shift and the night-shift may each bear its proper share.

With regard to overtime, however, it may be considered unnecessary to adjust the rates, unless it is seen that the

estimate of the total hours for the period is likely to be considerably exceeded. Where this is the case, the adjustment is advisable in order that the fall in the hourly rate of oncost may be set against the increased rate of wages.

Where the direct labour basis is in operation, the extra rate paid for overtime should not bear any proportion of the oncost, as it should be borne in mind that it is the stability of the wage-rates which is essential to the accuracy of costs prepared on this basis. The extra pay due to overtime tends to upset this essential feature, and should therefore be excluded, if possible, both from the figures of the standard period and from the period for which the estimates have been prepared. Overtime pay in these circumstances should be added to individual costs after the normal wage rates, and the oncost based upon them, have been charged.

The effect of night work and overtime upon costs is not generally understood. As to whether a night shift is economical depends on the nature of the business. In some industries such as the Iron and Steel, night work is economical because the cost of maintaining furnace fires does not then run to waste. But in ordinary manufacturing businesses it has been the general experience that night work is not truly economical, and Costing data with regard to this have in some cases shown remarkable results.

The treatment of overtime is a matter of great difficulty, not only because of its irregular character, but because it frequently only affects a section of the factory or even on occasion one or two machines in the factory. In such circumstances we have a series of operations which lie outside the normal factory organization. The cost of these operations is practically impossible to ascertain, and supposing it were possible, the value of the cost, when ascertained, would be extremely doubtful. The fact that we have, frequently in overtime, a collection of factory operations isolated from the main operations of the factory,

suggests also the advisability of isolating the ascertainable expense in connection with them.

It is the practice of some firms to include in the oncost expense the extra wage rates paid for overtime.

Tool-Setting Time.

In estimating the number of machine hours over which the factory expense is to be distributed, are we to exclude, or include tool-setting time? The answer is that sometimes this should be included, and sometimes excluded.

Where machines are engaged on continuous operations of fairly long duration, involving infrequent changes of tools, and where also the operation of changing tools is not a lengthy one, the estimated number of hours taken up with tool-setting should be excluded from the total machine hours, so that the cost of the tool-setter's time may fall equally upon the working hours of the machine through the medium of the oncost allocation.

We frequently find, however, that in the case of some machines, the hours involved in tool-changing are actually as great as the total working hours of the machine. In some cases, not only is the time of the machine attendants taken up, but overhead cranes are utilized for bringing heavy tools to the machine, and power is consumed in the operation of tool-setting.

In such circumstances as these, it is the usual practice to include hours spent in the operation of tool changing in the total working hours of the machine, and the time of the men engaged in tool-setting is allocated directly to individual "jobs."

Where it is considered that the conditions during tool-setting time and the ordinary working time of a machine are not substantially equal, the calculation of separate machine-hour rates for tool-setting time and ordinary machine time is advisable. This, however, does not often prove to be possible.

Labour and Oncost Expense.

The question of oncost allocation having been dealt with, it should be pointed out that the natural divisions of factory cost are really only two in number—material and labour, plus oncost.

The fact that the oncost charge has to be expressed as a separate factor has led to the idea that the division between labour and oncost is as clear as the division between labour and material.

The practice of expressing oncost as a percentage on labour has also led to the idea that any increase in the oncost percentage is a mark of inefficiency. This habit of mind will die hard.

As a matter of fact, the increase of the oncost is often a mark of increased efficiency, and the fact that, in highly organized manufacturing businesses, the oncost charge forms so large a proportion of the total costs supports this view.

The labour charge and the oncost charge may not have any very direct relation to each other. But assuming for the moment that they have, we must be very careful what lessons are drawn from their relationship. In order to decide whether a particular article is being produced economically, a little consideration will lead to the view that the labour and oncost charges are inseparable.

Let us take a simple illustration. Suppose that certain machine operations on which comparatively skilled labour was engaged cost £5, the oncost amounted to £2 10s., the total cost being therefore £7 10s. Now suppose that by a change of method it was found these operations could be performed by unskilled labour under skilled supervision. Under the new conditions the direct labour cost was £2 10s., and the extra supervision charges increased the oncost rate from 50 per cent. to 100 per cent. In spite of this it will be seen that the total cost is only £5, while under the old method the total cost was £7 10s.

In such a case it would be unwise to complain of the increased oncost charge, when the effect of this increase has been to reduce total costs.

Nevertheless many a works manager or works foreman has been taken to task because oncost charges, which include expense known by the pernicious term "unproductive," have increased in proportion to direct labour.

On the other hand, the danger of maintaining the same oncost rate when changes of this nature have been made in methods of manufacture is also apparent. A case was brought to light a short time ago of a manufacturer who was at a loss to understand why his trading results, as shown by his annual accounts, fell so far short of the results shown by his costings. The fact was that he had reduced his direct labour charges, and increased his indirect labour charges, but had maintained his old oncost rate. His so-called costs were no longer representative of the actual working conditions.

It will be seen, therefore, that the cost accountant has to deal with the inevitable fluctuations which occur in the ratio of the standard of measurement to oncost expense; whether the standard be direct labour; man-hours, or machine-hours.

The oncost expense as a whole does not rise and fall proportionately with the direct labour expended, or with the number of hours worked, either by men or by machines, but in ascertaining a cost which provides the highest standard of usefulness to the manufacturer, it is advisable to eliminate from individual costs the effect produced by these inevitable variations.

To enable this to be done necessitates the estimation in advance of the total output of direct wages or man or machine-hours, for a period sufficiently long to embrace the normal fluctuations in turnover, which are characteristic of most businesses.

This having been done on the basis of previous experience,

subject to adjustments which may be necessary to suit new conditions, it is advisable to assume for Costing purposes that the ratio of direct wages (or man or machine-hours, as the case may be) to factory expense, is a constant ratio. The fluctuations from the normal output, weekly or monthly, are better expressed as a separate feature of production costs. They should not enter into the ascertainment of the cost of individual "jobs."

Their extent, and their effect upon individual orders, may be easily ascertained, and the lessons to be drawn from the records of these fluctuations, relative to what we might call the normal or standard rate of oncost, are thus more valuable than they otherwise might be.

If the estimate of the factory output is accurate, the annual factory burden will be distributed exactly over the annual output, notwithstanding the fluctuations in the ratio of oncost to output, as before described.

If the estimate proves to be inaccurate, there will be a balance of undistributed factory expense, or a balance of factory expense distributed in excess of the actual amount, to the extent that the actual output falls short of, or exceeds, the estimated output.

The frequent changing of oncost rates necessitated by methods involving the allocation of the actual monthly factory expense over the actual output leads to variations in individual costs which reduce their value as a basis for the fixing of selling prices, and also of measuring the efficiency of methods of production in the factory.

CHAPTER V

SELLING and Distribution Cost—Selling Organizations—The Relation of Selling to Production Cost—Allocation of Selling and Distribution Cost—Its Relation to Turnover—Classification of Selling Expense—Expense not Readily Chargeable to Production or Selling Cost—Management Remuneration—The Function of Labour and Capital—What is Capital?—Interest on Capital as an Element of Production Cost—Reasons for its Inclusion.

Selling and Distribution Cost.

THE next element of cost as shown on the classification of the expense of production and distribution (see page 27) is distribution cost, divided into selling, delivery, and general distribution cost or expense.

The allocation of distribution expense to individual articles is beset with difficulties. In the ascertainment of factory cost, the chief difficulty, as already shown, is connected with the selection of a standard of measurement for the purpose of allocating oncost to individual "jobs" or articles.

It has also been shown that the bulk of the oncost expense is strictly related to the time involved in the manufacturing processes, and therefore standards of time as expressed in the man-hour or machine-hour methods will give truer approximations than other standards.

Relation of Selling to Production Costs.

In considering selling expense, however, other factors of great importance enter in, the measurement of which, and the allocation of which, to individual articles are matters of great difficulty. Whereas, in the manufacture of an article, the expense of production, however difficult to obtain, is strictly related to the nature or class of article, the selling expense is *not* limited to this consideration. Between the cost of producing an article, and the cost of

selling that article, there exists no relation whatever, and therefore it is impossible with any degree of accuracy to distribute the selling or distribution expense in proportion to factory cost.

Selling Organizations.

We have already dealt with some of the difficulties arising in connection with the allocation of distribution expense. It requires very little consideration to perceive that the selling costs of the same manufactured article may vary according to the nature of the organization effecting the sale.

The same article, for instance, may be sold to wholesale merchants in large quantities, involving a minimum of clerical expense ; or it may be sold in small quantities to small consumers, involving increased handling and clerical charges.

Selling organizations on the whole exhibit greater differences than manufacturing organizations, and they differ not so much with regard to the class of articles sold as to the class of consumer which the manufacturer lays himself out to supply.

There are, of course, very broad distinctions existing amongst manufacturers. The manufacturer of household furniture does not usually make textiles. The manufacturer of bedsteads does not also make motor cars, and the manufacturer of pottery does not also make cocoa.

Nevertheless, although the classes of industry fall broadly into defined groups, one finds extraordinary differences in the classes of articles manufactured, not only within these groups, but within the manufacturing organization of a single member of any group.

Take, for instance, the electrical industry. We have within this class manufacturing organizations engaged in the production, certainly of electrical goods only, but goods varying in size and value from a small electric

switch to the largest type of generating plant. These products may be marketed substantially by the same selling organization. The nature of that selling organization, and the extent of the selling expense, are governed more by the commercial policy of the manufacturing organization, than by any other factor.

Some concerns may adopt the policy of supplying their commodities to large and small classes of consumers. For instance, a manufacturer may supply his goods to warehousemen, and also to retailers ; but whether the retailer purchases direct from the maker or from the warehouseman may make very little difference to the purchase price. Why is this so ? It is because the manufacturer's expense of selling to large warehousemen is less than the expense of selling to retailers. It does not necessarily follow that the manufacturer dealing with retailers receives a larger margin of profit out of this department of his business than out of the department supplying the same goods to the middleman.

Even within the same department, however, the cost of selling goods of equal value may vary greatly. Some articles, on account of either their essential nature, or particular reputation, or intrinsic merit, may appeal so immediately to the purchasing public that very little effort is required to effect sales.

There are articles, also, attached to which is a guarantee of good service for a certain period, or in connection with which the manufacturer undertakes periodical inspection, free of cost. Such expenses as these are strictly distributable over the output of the particular articles in respect of which these undertakings have been made.

The solution of the problem of distributing selling expense so as to give due effect to these varying conditions is not by any means a simple matter.

Many manufacturers adopt a policy of producing standard lines at standard prices, and it might be thought

that, in such circumstances as these, any effort to differentiate between the selling expense in connection with the same article, sold under different conditions, is wasted effort. This is not necessarily so, for whatever the selling policy might be, it can scarcely be considered unchangeable, and in any case the ascertainment of selling costs may show that in certain directions the selling policy is wholly mistaken.

The ascertainment either of factory cost or of selling cost need not have any direct bearing upon the fixing of the selling price, but it often does very profoundly affect the particular trade policy pursued by commercial concerns.

Allocation of Selling and Distribution Cost.

The proportion of selling and distribution expense to factory cost, however, is generally not very large. One does not usually find that selling and distributing expense incurred by manufacturers exceeds 10 per cent. of the factory cost. Where the selling organization is elaborate, or where the manufacturer himself takes steps to create a general demand for his goods by incurring advertising expense, the selling cost may, of course, exceed this percentage, and special care must be taken in its allocation.

The method most frequently adopted by manufacturers is to distribute selling expense in proportion to the factory cost.

In some cases the method of distributing this expense in proportion to the selling price is adopted. This is almost the invariable custom in the retail trades.

Units of value, however, cannot form even approximate bases of allocating selling expense, this expense depending chiefly on the cost of handling the goods, which varies with the nature, weight and bulk. These three characteristics are obviously independent of value, and therefore cannot be measured by value.

In some industries, it is possible to adopt a unit of weight or measurement. In coal distribution, for instance, the distributing expense is easily and equitably calculated as an expense per ton. In the brewing industry, the unit may be the barrel, and in the textile industry the unit may be the yard. Other units may be adopted suitable to the particular class of trade.

In the case of a business manufacturing numbers of articles varying in kind, the adoption of a unit other than a unit of value does not appear to be possible and, in spite of its obvious defects, its adoption for this reason becomes a matter of necessity.

Some of these defects may be remedied by classification of the articles sold, and where necessary, by departmentalization of turnover, based upon the conditions of the markets supplied.

For instance, a manufacturer's business may be divided between export merchants ordering large quantities of goods, and smaller consumers who require to be visited more frequently by travellers carrying patterns expensive to handle. He may, in addition to these two departments have a foreign connection, which he maintains by incurring selling expense of a special nature, such as the maintenance of a warehouse or showroom in a foreign country.

Such conditions would necessitate a division of the turnover into three parts, so as to show the extent of the turnover in each of these markets. The division of the selling expense into three parts would also be necessary in order to ascertain the costs of selling and distributing in each of these markets.

A further classification may be necessary, which would distinguish between goods of varying weight and bulk, so that expenses of handling may be more equitably distributed over each class. This is often a difficult matter, and the extent to which such division is necessary will depend upon the circumstances of each case.

Selling Cost and Turnover.

Another factor to be borne in mind in classifying commodities is the rapidity of turnover. *This is a most important element.* An article, the stock of which has to be replaced every month, should bear a smaller proportion of selling expense, relative to the value of the article, than goods of which the stock is only exhausted once a year.

Very little attention has, however, been given to the problem of allocating selling expense. This is probably due to the fact already stated that this expense does not usually exceed 10 per cent. of the total factory cost. In many cases, the selling expense is often as low as 3 per cent. or 4 per cent., and in these circumstances it is not surprising to find very little trouble taken in determining the true incidence of an expense forming only a small fraction of the total selling price.

In this matter, an intelligent classification of the expenses falling under the general heading of distribution cost is very valuable. Quite frequently it will prove all-sufficient for the purpose of deciding what percentage should be added to the factory cost of goods belonging to a particular class, or supplied to a particular market.

Classification of Selling and Distribution Expense.

This expense may be divided generally into four distinct groups—

(1) **Buying Expense.** In a manufacturing concern there may be no expense falling under this head, as the cost of purchasing and storing materials is considered to be part of the factory cost and therefore distributed over the goods manufactured through the oncost.

As already explained, some businesses adopt the method of applying this expense to the total factory cost under the general heading "Establishment Expense," which

includes cost of general office administration, general management, and selling and distribution expense generally.

The idea underlying this method is that these expenses are more equitably disposed of by means of a percentage on total factory cost than by any other method, because factory cost includes cost of material. This method has certain defects which will be mentioned later. The practice is, however, very widespread. By its adoption the difficulty of apportioning certain expense between factory and distribution cost and also between different departments of the factory is avoided.

Buying expense will include salaries and wages of those engaged in the business of purchasing materials, keeping records of such purchases, checking deliveries, and also other expenses of a miscellaneous character traceable to this source. In cases where the cost of purchasing raw materials is charged to the factory cost, expense under this sub-heading of distribution cost may not arise.

As a matter of fact, however, one frequently finds that quite a considerable turnover in merchant goods forms part of a manufacturer's business. These goods are not subjected to any manufacturing operation, and for Costing purposes, therefore, it is only necessary to add selling and distribution expense, and profit, to fix the selling price of these commodities.

By merchant goods is meant, of course, goods purchased ready for sale. In some manufacturing trades quite a large part of the turnover is of this nature.

In the jewellery and silversmith trade, for instance, factoring or merchanting by manufacturers of the patterns of other makers takes place to a very considerable extent.

A maker of general electro-plate ware may not manufacture such articles as spoons and forks, the production of which is more or less special, and confined to particular makers. He may nevertheless have a large connection

in these factored lines amongst his own customers. These he purchases ready for sale, stamped, it may be, with his own name and with his own brand or trade mark.

Of the total annual sales, exceeding £1,000,000, of an important engineering works, for example, £100,000 represents the approximate turnover in factored goods.

In such cases it is necessary to provide for the allocation of the buying expense in such a manner as to ensure that merchanted goods will bear their proper share.

(2) The second group consists of expense which is purely selling expense. Its separation from the distribution expense is necessary, because its incidence falls irregularly over the total sales. Under this heading will be included advertising, salaries of travellers, agency commissions, and travellers' expenses. Other expenses may possibly come under this heading, according to the nature of the trade.

(3) The third group includes all delivery expense, such as wages of packers and forwarding clerks, running expenses of vehicles, and other miscellaneous expenses.

The treatment of carriage is governed purely by circumstances. In some cases the selling policy may necessitate the free delivery of particular classes of goods, and under these conditions it is useful to know the average cost of delivery in relation to this class.

Frequently, however, the cost of carriage and freight is added to the sales invoices, and cannot therefore be regarded as a distributing expense. The same remarks apply to packing cases and materials. These charges are usually deducted from the total sales, and set against the actual expenditure under these heads.

(4) The fourth group may be termed General Expense. Under this heading, we include office salaries, office supplies, office rent, and general expense. Losses due to bad debts are sometimes included under this heading. In the majority of cases this is not advisable, as the fluctuating

character of this loss tends to upset the ratio of this expense to the total distribution expense.

In some trades, losses from bad debts are infrequent. In other trades, however, they are inevitable, and form a fairly regular expense of the business. These are also often peculiar to particular classes of customers, and the allocation of this expense should be dealt with accordingly.

Under these four sub-headings of the general distribution expense, therefore, expenditure is classified which it may be advisable to allocate in varying proportions to different sections or departments of the total sales.

Results obtained by this method are sufficiently accurate in the majority of cases, and the method may be regarded as a distinct advance upon the general method of allocating the total selling and distribution expense as a uniform percentage rate to factory cost.

Expense not Readily Chargeable to Production or Selling Cost.

There are certain business expenses which do not fall easily into factory expense or distributing expense. We have, for instance, possibly the payment of directors' fees and auditors' fees, as well as the expense of a general staff whose work is concerned with all the activities of the business.

In the schedule showing the classification of the expense of production (see page 27) it will be seen that a clear division has been made between factory expense and selling and distributing expense.

The activities of a manufacturing business consist of purchasing, manufacturing, and distributing, and a board of directors is usually concerned with matters affecting all of these departments.

The same reflection applies to the auditors' fees, and these expenses, therefore, are strictly divisible between the factory cost and the distribution cost.

It is the more general practice, however, to attempt no division of the expense of the administrative staff, but to include all these under the general heading of Administration or Establishment Charges, because of the difficulties of apportionment.

From a practical point of view there is perhaps little to choose between the two methods, but we should not shut our eyes to the benefits which accrue from as strict a recognition as possible of the theoretical divisions of business operations.

The recognition of these divisions frequently induces clearer thinking than would otherwise be the case in connection with Costing problems. It is clear thinking, and the comprehension of the separate functions observable in all business activities, which tends to improve the science of Costing generally.

In this connection, mention should be made of the difference one usually finds between the accounting methods of private firms, and those of Limited Companies, public and private. Whereas in the case of most Limited Companies the remuneration of the management passes automatically into the oncost expense, no such procedure is usually found with private businesses, whether these private businesses are owned by a firm, or by a single proprietor.

Management Remuneration.

The reasons for this difference are easily discerned. In the case of a public Limited Company, the remuneration of directors and managers is usually fixed on an ordinary commercial basis, the balance of profit being distributed on the basis of the shares held by individual shareholders, or placed to reserve.

In the case of a private Limited Company, one frequently finds that the remuneration of directors actively engaged in the conduct of the business is fixed at a figure considerably in excess of what may be regarded as ordinary commercial remuneration.

There are cases where the whole of the profits of private Limited Companies, consisting of only two working members, are distributed as remuneration and not as dividends on share capital held.

There is a reason for this. For income tax purposes, the profits of a Limited Company are assessed at the full rate of tax from time to time. At the present time the rate is 6s. in the £1. No reduction of this rate can be obtained from the tax on that part of the profits left undistributed. The part of the profits distributed to the shareholders is finally taxable at a rate which is dependent on the total income from all sources of the recipient. These dividends, however, are also treated as unearned income and assessed at the higher rate applicable to unearned income.

In the case of a private partnership, or a single proprietorship, however, the whole of the profits of the business are treated as earned income, and are assessed on the individual partners at the earned rate, whether these profits are actually distributed or not.

It is therefore seen that, from an income tax standpoint, the position of a partner in a firm is one of considerable advantage, at any rate so long as his total income does not render him liable for super-tax, in which case, incidentally, his position of advantage is turned to one of disadvantage. In a private Limited Company consisting of two working members, the disability which they suffer under the Income Tax Acts is often got rid of by the simple expedient of calling the profit remuneration.

The treatment of such remuneration as part of the expense of production would not usually result in the production of a commercial cost. It is advisable, therefore, to provide in the oncost for such a figure as will represent the ordinary commercial value of the services rendered to the business by the proprietors.

In the accounts of partnerships, frequently no provision is made for remuneration of the partners other than the

crediting to their respective capital accounts of the share of the profits to which they are entitled. For Costing purposes the services rendered to the business by the partners are not assessed, a rate of profit sufficient to cover these services being added to what is called the cost of each article produced.

Although the remuneration accruing to the proprietor of a business is generally considered to be profit, it is advisable for Costing purposes to have a clear idea of what should be regarded as the cost of production, and what should be regarded as profit.

Function of Labour and Capital.

Apart from the obvious advantages to be gained under competitive conditions by making Costings as uniform as possible, there is a clear advantage in the recognition of the distinction between the function of labour (whether the labour be the labour of the proprietor or that of an ordinary wage-earner) and the function of capital.

The terms *labour* and *capital* are used in the fullest sense, of course, and not in their present day political significance, which tends to obscure the truly economic standpoint.

In the absence of competitive conditions what principles could be followed in order to remunerate labour and capital for their services?

So far as labour is concerned, we may assume that commercial standards of value exist. Although these standards may be more or less inconstant, they nevertheless enable values to be placed on most services which producers render to consumers.

Such values should be placed for Costing purposes upon the services rendered to a business by its proprietor or proprietors. That having been done, the balance may be regarded as profit, or the remuneration of the capital which the proprietor has at stake in the business.

Costings, whether those of a private business, or of a public or private Limited Company, are then as uniform as they can be made without closer relationship amongst competitors. That is to say, the total costs provide for the remuneration of all services rendered in the business, and the profit provides for the remuneration of the capital employed in the business.

What is Capital ?

It should be remembered also that for this purpose capital should be regarded from the purely economic standpoint. The capital of a Limited Company is not merely its Share Capital, *but the whole of the Capital employed in the business, of whatever denomination.*

A very neat definition of capital is one used by Mr. Webster Jenkinson in a lecture delivered to the Leeds University Engineering Society in January, 1914. He defined capital as *the total assets in any business less the amount of credit obtainable without payment of interest.*

It follows, therefore, from this definition that for Costing purposes no distinction should be drawn between capital of varying denominations, these variations arising, not through any difference of function which capital performs, but from the difference in the legal rights and privileges which the holders of each class, or denomination, enjoy.

From a Costing standpoint the remuneration of all this capital is on the same level. Expenses, therefore, such as bank interest, debenture interest, and interest on loans of any kind, secured or unsecured, form no part of the costs of production, except to the extent that we regard interest on capital as part of that cost.

In classifying factory expense, or general establishment expense, all these items which we have mentioned should be eliminated.

Interest on Capital as an Element of Production Cost.

This introduces the question whether interest on capital should be included in the costs of production.

In discussing the separate functions of production usually found in a manufacturing business, emphasis was laid upon the advisability, particularly in connection with the building expense, of placing a business owning its own premises and a business renting its premises on the same basis.

The reason for this is that the provision of premises is not of itself a manufacturing function and, to secure uniformity of costs in both these cases, the building expense should not be different, merely because in the one case the premises are owned by the business, and in the other case they are not.

In the former case, the ownership of the business premises should be regarded as an investment of capital, lying outside the investment necessary for purely production purposes. The factory should therefore be charged a rental for the accommodation which the buildings provide, that rental consisting of interest on the capital invested in the buildings, plus a provision for the expiring cost in the case of leasehold premises, and a provision for depreciation in the case of freehold premises.

The same principle is advisable where a business supplies its own power, the provision for interest on capital invested in the power plant, and also depreciation of the plant, being included, so that the expense of power production may be compared with the cost per unit of power supplied from an outside source.

Many accountants who have specialized in Costing consider that this principle should be extended to the whole of the business equipment. That is to say, that the costs should be charged with interest on the capital value of the

plant and machinery and of other assets employed in the business of production.

Those who are not in favour of charging this interest take the view that interest is itself a form of profit, and that therefore no portion of this profit should become diffused through individual costs.

Inclusion of Interest on Capital.

There are reasons why interest on capital should be charged to costs.

Let us suppose the case of two businesses manufacturing the same articles. In the one case, the plant equipment is only small. The raw materials are purchased in small quantities, and the capital employed is therefore proportionately small. To make the illustration clearer we may assume the capital to be £5,000. The yearly interest on this capital at 5 per cent. would be £250.

In the second case, purchases of raw material are made in larger quantities and at smaller cost. The plant equipment is more costly, and much more suitable for the manufacture of the articles produced, so reducing labour costs. We will assume that in this case the capital invested is £10,000, the annual interest on this amount at 5 per cent. being £500.

What is the relative position of these two businesses, assuming the output of both to be practically equal?

In case No. 1 the manufacturing cost is increased—

- (a) By the higher cost of material.
- (b) By higher labour cost, due to the inferior nature of the plant employed.

In case No. 2 material cost and labour cost are lower, but against these two advantages should be placed the disadvantage due to the fact that the capital outlay in the second case is twice that of the first.

If the costs of these two businesses, therefore, are not to be misleading, we must provide in the costs a charge for

interest on capital. As this charge in the second case is greater than in the first case, the advantage gained in case No. 2 through superior plant equipment, and ability to purchase raw material in larger quantities and at lower cost is to this extent reduced.

It is quite clear that in these two cases costs which include this element of interest form a more reliable guide, and reflect more truly the relative conditions than costs which do not include it.

In other cases, also, it is easily seen that the provision of a charge for interest is a factor of considerable importance.

In the case of wine production or whiskey distilling, when finished products are left for years to mature, some provision for interest on the capital locked up in this way is essential if costs are to be any guide at all.

The same holds good in the furniture trades, where timber is held for a long period before it is considered to be well seasoned and fit for use. If in such a case £10,000 worth of unseasoned timber is purchased but not requisitioned for use for two years, it is clearly seen that the timber has actually increased in value during that period. The extent of this increase in value may be considered at least equal to the interest on the purchase price for the period.

If no distinction is made in the costs between furniture manufactured from comparatively unseasoned wood and furniture made from well seasoned wood, the costs cannot be considered complete and reliable.

For these reasons, therefore, interest on capital may be considered as an element in the cost of production.

When we come to the problem of allocating interest on capital to individual products, it may be said at once that to do this accurately is impossible.

No difficulties arise, however, in the allocation of interest on plant and other equipment, and a charge of this nature reaches individual costs just as any other expense of production would do.

The provision of interest on materials held in store is, however, one of considerable difficulty. In cases where the amount of credit obtained without payment of interest equals approximately the stock of materials carried, the provision of this interest may be ignored. The treatment of the problem in other cases will depend entirely on circumstances.

Another difficulty arises in the treatment of interest on capital as part of the costs of production. The inclusion of this interest in individual costs increases the cost value of stocks on hand, so that an apparent profit is shown before the sale of the articles.

The distribution of such profit to shareholders in the case of a Limited Company would be an illegal distribution, it being a recognized principle that profits must not be anticipated.

This difficulty, however, is not serious. The interest on capital charged to costs is credited as interest in the general Profit and Loss Account of the business. The interest included in the cost of stocks on hand and work in progress should therefore be reserved against this credit to Profit and Loss, and carried forward in the same way as a reserve for any other contingency would be.

In estimating the capital employed in a business for Costing purposes, all capital expenditure unrepresented by tangible assets should usually be excluded. As illustrations of unrepresented expenditure, we may cite such items as goodwill and preliminary expenses, as well as advertising expenditure which is occasionally included in business assets.

Advertising expenditure such as that incurred by Selfridge's prior to the opening of their London store is similar in its nature to goodwill.

Goodwill is the premium paid for the opportunity of earning a higher rate of profit in any particular business due to the existence of profitable contracts at the time the goodwill was

acquired, or to monopolies of sale of patented articles or other inventions, or to the unique position of the business premises, and the reputation established in past years.

Goodwill as popularly understood frequently represents nothing at all, as many investors have found to their cost.

In any case, interest on expenditure incurred in the acquisition of goodwill forms no part of production costs, and should not be reckoned in the capital of the business for Costing purposes.

We have now reviewed in a fairly comprehensive manner the whole cost of manufacture and distribution.

There remain a few items of expenditure and of income incidental to most businesses which fall outside the functions of production and distribution.

Items of this nature are discounts allowed on sales, and discounts received on purchases. Discounts allowed are a deduction from trading profit to be borne in mind when fixing selling prices. The practice of allowing discounts on payments varies very much, but the underlying principle with regard to them is this: It is a benefit to any trader to promote quick circulation of his capital; and prompt payment of debts due to him not only reduces the risk of bad debts, but leads to economy of capital employed in the business.

Discounts received on purchases are also usually regarded as falling outside the costs of production. In some cases, however, it might be thought expedient to give to individual contractors the benefit arising from discount on purchases.

Other items falling outside costs of production are interest on bank overdrafts, interest on mortgages or debentures, legal charges, income tax, and charitable subscriptions or donations. These and other items of expenditure are rightly regarded as deductions from, or appropriations of, trading profit.

CHAPTER VI

THE Factor of Profit and Selling Prices—The Relation of Capital to Output—Its Importance in Determining Rates of Profit—An Improved Form of Annual or Periodical Accounts—"Counting-house" Accounts—Their Limitations from a Costing Standpoint—The Improved Form of Accounts considered in Detail.

THE allocation of selling and distributing expense to the products of the factory has now been dealt with. Between the cost of producing an article and the cost of selling that article we have seen there exists no relation whatever, and that it is impossible with any degree of accuracy to allocate the selling and distribution expense in proportion to factory cost.

We have also seen that the selling costs of the same manufactured article may vary greatly, according to the nature of the organization effecting its sale, and according to the market in which the sale is effected.

We have discussed also that other important factor in relation to the allocation of selling expense—rapidity of turnover. Articles sold as readily as they are made, for which there is a constant demand, should bear a smaller proportion of selling expense than articles requiring some effort to sell, and which may remain in the warehouse for some considerable time.

It has been pointed out that although no relation exists between factory cost and selling cost, the adoption of a unit other than a unit of value as a basis of apportionment does not in many cases appear to be possible.

The defects of this method are minimized greatly by intelligent classification of the articles sold and departmentalization of the distribution expense.

The analysis of distribution expense under four heads was recommended, viz.—

- (1) Buying expense,
- (2) Purely selling expense,

(3) Delivery expense,

(4) General Administration expense.

With expenditure classified in this manner, and bearing in mind the factors governing the incidence of distribution expense generally, the apportionment to separate articles, or classes of articles, may be made sufficiently accurate in most cases for all practical purposes.

Factor of Profit and Selling Prices.

With this, then, the whole cost of manufacture and distribution has been reviewed, and the only remaining element of cost is that of profit. It is impossible to reduce the calculation of profit to well defined rules. Profit is the difference between cost and selling price, and there are innumerable factors governing the fixing of selling prices, factors which know no law, which are capricious and arbitrary.

Competition is perhaps responsible for the fixing of a larger proportion of selling prices than any other factor, and the law of supply and demand is inexorable. In the presence of these facts, the knowledge most essential to a manufacturer is the knowledge of total cost. The comparison of total cost with selling price will show what profit or loss is incurred on every sale, and this alone will give him a power over his selling organization which is absent where total cost is an unknown quantity.

There are, however, certain broad principles which it is useful to bear in mind in fixing selling prices of articles for the moment not subject to external influences.

Relation of Capital to Output.

The most important of these is the relation of capital to output. Sufficient has been said upon the necessity of distinguishing clearly between the function of labour and the function of capital, including the necessity for Costing purposes, of assessing the services of privileged persons

engaged in any business, such as the services rendered by proprietors, at the ordinary commercial rate of remuneration.

This having been done, the total costs will provide for the whole of the expenditure incidental to production and distribution ; and assuming all the manufactured articles were sold at the cost price so ascertained, the income would exactly balance the expenditure.

A commercial policy of this kind is not a practical proposition, for the costs do not provide for the remuneration of the capital employed in the business, beyond possibly the provision of interest which the investment of that capital in gilt-edged securities would yield.

In order to attract capital to industrial concerns a reasonable prospect of an interest yield commensurate with the risks to which such capital is subject must be held out to those invited to subscribe.

In the coal mining industry, the average yield on the capital employed is approximately 10 per cent. The earnings of capital in many other industries are about equal to this rate. In some they exceed it, and in others they fall short of it.

In determining the amount of profit to be added to cost, the relation of the total capital employed in the business to the total output should be clearly understood. The costs having provided for the remuneration of all services, exclusive of the service rendered by capital, it follows that the reward of this service is the only provision to be covered in fixing profit. A manufacturer, therefore, must for this purpose decide what rate of remuneration he may fairly claim for his capital, having regard to market conditions and bearing in mind all the risks to which it is subject.

Assuming we are agreed upon this principle, how is it to be applied to individual costs?

Let us suppose that the capital employed in a manufacturing business is £10,000, and that the total annual

output is £40,000. By output is meant the total cost of production and distribution. It follows, therefore, that if a remuneration of 10 per cent. on the total capital employed is considered reasonable and adequate, an addition of $2\frac{1}{2}$ per cent. to each individual cost will yield this remuneration. If the manufacturer considers 20 per cent. more reasonable, it would be necessary in that case to add 5 per cent. to total costs.

Determining Rates of Profit.

Looking at this problem from another angle we may state it thus: *In adding any percentage to cost, it is extremely useful for the manufacturer to know what return upon the capital employed in the business is thereby provided.*

In fixing selling prices, therefore, a manufacturer or merchant should have regard to this fundamental principle. It is not, of course, the only factor which he must take into account. He may decide that a selling price ascertained in this manner is too high, having regard to the selling prices of similar articles placed upon the market by his competitors. He may decide that the price ascertained in this manner is too low, having regard to the fact that the prices of competing firms are so much higher than his own. Or he may deem it advisable to make provision against the risks incidental to a fall in the demand, or to a fall in the value of the basic materials of which the article is composed.

The fact remains, however, that whatever further contingency it may be advisable to reserve for in fixing the selling price, this is the fundamental principle which should be borne in mind. Unless it is so borne in mind, the fixing of selling prices is little better than guess work, and one of the principal factors promoting conditions of stability in trade is thereby ignored. In this matter, as in all matters, "knowledge is power," and the fixing of a price with full knowledge of all relevant factors is a much

superior procedure to the fixing of prices without regard to this principle.

Many manufacturers, however, do not take into account this factor in arriving at selling prices.

The following illustrates this fact. A group of seven or eight manufacturers in a certain industry undertook to supply goods identical in kind to contractors who were in urgent need. The question of price was left open, and it was a condition of the contract that, in the event of disagreement, an independent arbitrator should be asked to fix the price.

The contractors were also asked to suggest a rate of profit on the cost which they considered reasonable in the circumstances. The suppliers suggested $12\frac{1}{2}$ per cent. on the selling price, which is equivalent to approximately 14 per cent. on the cost.

It fell to the writer's lot to meet the suppliers, in order to discuss this rate of profit. In answer to the question why this rate was considered reasonable, the opinion was expressed that it was "just about right." No clear idea existed amongst the suppliers, beyond the expression of this general opinion.

An examination of the accounts of each of these suppliers revealed the fact that the percentage of profit earned in the industry, expressed as a percentage on the cost, averaged 6 per cent., and that the percentage on turnover required to give 10 per cent on the capital employed was an average of 5.8 per cent.

It is clearly seen from this illustration that a selling price fixed without regard to the relation between capital and output may be either too high or too low, according to the circumstances of each case.

It may be thought that a remuneration of 10 per cent. on the capital employed is too small. In some industries where the risk to the capital is above the average, this may be so. But it should be remembered that the capital

employed in a business is not merely the share capital, but capital which answers to the definition already laid down, namely, "The total assets, less the amount of credit obtainable without payment of interest."

Some of this capital may be in the form of debentures at 5 per cent., preference shares at 5 or 6 per cent., a bank overdraft, and a reserve fund built up out of the undistributed profits of past years.

A profit, therefore, representing 10 per cent. on all this capital would be sufficient to pay a dividend on the ordinary share capital in excess of 10 per cent.

Supposing for instance the total capital employed in a business consisted of—

- (a) £10,000 Ordinary Share Capital,
- (b) £10,000 5 per cent. Preference Share Capital,
- (c) £10,000 Undistributed Reserve,

a profit of 10 per cent. on the total capital employed would be sufficient to pay 25 per cent. on the ordinary shares, after paying the preference dividend.

Improved Form of Periodical Accounts.

Having got thus far, it may be helpful to fix the general principles which have been laid down, if we consider what form the Periodical Accounts of a manufacturing business should take.

In this connection it is advisable to refer to the *pro forma* accounts set out on pages 88 to 90, illustrating the main differences between the ordinary form of annual accounts as prepared by the majority of manufacturing businesses in this country, and the form these accounts take when drawn up from a Costing standpoint, which, for a manufacturer, is after all the most valuable standpoint.

"Counting-house" Accounts.

Before examining these in detail, however, let us consider the nature of the information which accounts, drawn

up on ordinary commercial lines, convey to those interested in the management of a manufacturing business.

These accounts may be called "Counting-house Accounts," because they are prepared usually from the strict counting-house or commercial standpoint, and notwithstanding the fact that they can be made really useful from a Costing standpoint, the attempt is rarely made by the financial department of any business to make them useful in this way.

As a matter of fact one frequently finds financial records compiled in the counting-house entirely divorced from the records compiled in the cost office. In fact, the traditional standpoint of the counting-house towards the Costing department is one of exalted superiority.

Commercial accountancy is in this way asserted to be watertight, not susceptible to any improvement in the direction of facilitating the work of the cost office. This is the condition which one unfortunately finds existing in large numbers of business concerns, and it forms a formidable obstacle to progress, even where this progress is seen to be most desirable.

MANUFACTURING ACCOUNT

FOR YEAR ENDED 31ST DECEMBER, 1918.

Direct Material from Store	£	20,000
" Labour	£	9,650
Factory Oncost, viz.—		
Department X	7,470	
" Y	11,300	
" Z	2,880	
	<u>21,650</u>	
TOTAL MATERIAL, LABOUR, AND ONCOST		51,300
Work in progress, viz.—		
Balance at 31st December, 1917	1,250	
Less Balance at 31st December, 1918	1,000	
	<u>250</u>	
TOTAL COST OF FINISHED GOODS		£51,550

SUMMARY OF FACTORY EXPENSE.

	Total.	Departments :		
		X.	Y.	Z.
	£	£	£	£
Building Expense . . .	3,000	1,000	1,500	500
Power	1,000	250	500	250
Plant Maintenance . . .	700	200	300	200
„ Depreciation & Insurance.	1,600	500	800	300
Miscellaneous Supplies . .	350	100	200	50
Indirect Labour	11,000	4,000	6,000	1,000
Management and Supervision	2,500	1,000	1,000	500
Organization	500	200	250	50
Stores Expense	750	250	400	100
General	400	30	340	30
	21,800	7,530	11,290	2,980
Adjustment of Oncost . .	150	60	10	100
	£21,650	£7,470	£11,300	£2,880
		HOURS.	HOURS.	HOURS.
Yearly hours per unit :				
300 days of 8 hours each.		2,400	2,400	2,400
Less Deductions for contingencies . . .		300	200	100
		2,100	2,200	2,300
No. of units in each Dept. .		20	25	10
		42,000	55,000	23,000
Hourly Expense Rate . .		3s. 7d.	4s. 1d.	2s. 7d.

Dr. PROFIT AND LOSS ACCOUNT *Cr.*
FOR TWELVE MONTHS ENDED 31st DECEMBER, 1918.

<i>Dr.</i>	<i>Cr.</i>
To Cost of Goods sold, viz.— Stock at 31st Dec., 1917 . 6,000 <i>Add</i> Finished Goods from Factory . 51,550 <u>57,550</u> " Stock at 31st Dec., 1918 . 5,550 <u>52,000</u> " Adjustment of Factory On-cost . . 150 " Gross Profit . . . 11,850 <u>£64,000</u>	By Sales . . . 65,000 <i>Less</i> Returns, etc. . . 1,000 <u>64,000</u>
To Distribution Expense, viz.— Selling . . 1,500 Delivery . . 750 General . . 3,250 <u>5,500</u> " Bad Debts . . . 100 " Discounts on Sales . 150 " Net Profit from Manufacture . . . 6,225 <u>£11,975</u>	By Gross Profit brought down . . . 11,850 " Discounts on Purchases . . . 125 <u>£11,975</u>

The ordinary form of financial accounts is based upon a very simple principle, although it assumes at times a complex character. Taking, however, a simple form, of which the more complex form is only an elaboration, we find that these accounts represent a periodical focusing of the transactions of buying and selling only.

This periodical focusing of transactions takes place usually once a year, sometimes at shorter intervals. On the one side of the account we have the expenditure of the business, classified under various headings. First of all, we have the heading of Purchases, which may be expressed in a single amount or analysed under subsidiary groups, such as copper, brass, finished goods, or castings, stampings, steel bar, such subsidiary groups varying according to the nature of the business.

The next item is Wages, after which there follow the general expenses of the business classified under such headings as—

- Rent, Rates and Taxes,
- Printing and Stationery,
- Insurance,
- Advertising,
- Salaries,
- Travelling Expenses,
- Commission,
- Bad Debts,
- Bank Charges,
- Depreciation.

On the credit side of the account is placed the total sales, discounts received, interest received, and it may be one or two other items which for present purposes it is unnecessary to mention.

This account is drawn up so as to include every known expense incurred in the conduct of the business for the period covered by the account, and also includes every known source from which income is derived.

Limitations from a Costing Standpoint.

Accounts drawn up in this way are, of course, very valuable, particularly for comparative purposes, as the classification of expense under various headings such as Rent, Rates and Taxes, Printing and Stationery, admits of comparison of these expenses with previous periods. Any rise or fall on individual items may therefore be noted, and their cause ascertained.

The Balance Sheet, also, which accompanies the Profit and Loss Account, focuses the Assets and Liabilities as they appear in the books of the concern at the ending date of the period covered by the Profit and Loss Account, and forms a very useful guide to those having the financial control of the business.

It shows, for instance, the value of the current assets ; that is to say, those assets which in due course will be converted into cash, and it shows the extent of the current liabilities which in due course it will be necessary to meet.

But the limitation of the ordinary Profit and Loss Account is this, that it focuses only the records of the merchanting aspects of business.

It is a summary of records which are for all intents and purposes exclusively confined to the recording of external obligations incurred by or to the business.

The records on the one hand are confined to the record of the receipt of goods purchased (or services rendered) and the payment for these purchases and services, and on the other hand to the issue of goods sold and the record of payments received in respect of the issue of these goods.

Values are measured only of goods inward and outward, a practice which is obviously indispensable to the conduct of any business at all.

This is an important feature of the common form of Profit and Loss Account. It means that the whole of the expenditure appearing on the one side of the Account may

not necessarily have been consumed in the production of the sales values which are set against this expenditure.

Once a year, therefore, or periodically, an attempt has to be made to arrive at the value of this unconsumed expenditure, consisting of materials which have gone into the factory, but which have not come out. Their value may also have been enhanced by expenditure incurred upon them in the performance of manufacturing operations, and they are consequently in varying stages of progress towards complete manufactured articles. This periodical valuation is known as stocktaking.

Stocktaking is an attempt to arrive at the enhanced value of materials passing through the factory, of which there is no record in the books. By this is meant that the balance of stock is not ascertainable by accounting processes. There may be statistics showing costs of processes, and operations. There may be stores records showing quantities of unissued stores. None of these records, however, forms an integral part of the Financial Accounting system. They are not co-ordinated. They do not establish a complete connection between the inward and outward flow of values taking place day by day. Therefore the operation of Stocktaking becomes necessary.

Stocktaking valuation has been defined as an unreconciled difference in the books, and this is precisely what it is. It is an attempt to bridge the gap which exists between records of purchases and expenses on the one hand, and sales on the other. There is actually a flow of values along this gap, but they are values which, relatively speaking, remain unmeasured. Though there is a continuous piling up of values inside the factory, and a continuous outflow of those values, the expression of these movements forms no part of the common system of accounting. Values are poured in at the one end, and poured out at the other, but the identity of the stream is not maintained. In fact, it is treated as two streams having very little connection with each other.

Having valued, therefore, the unconsumed expenditure or "Stock" charged against the income for any period, we deduct in effect this unconsumed expenditure from what has been charged. We then strike a balance. If this balance represents an excess of income over unconsumed expenditure, it is called profit. If the balance represents an excess of unconsumed expenditure over income, it is called a loss.

What is the meaning of this balance? Assuming that our unconsumed expenditure, or "Stock," has been correctly valued, the balance of the Profit and Loss Account is, in fact, an aggregation of profits and losses; and it is an aggregation of which the manufacturer as a rule knows practically nothing definite or reliable,

It is usually said that a Balance Sheet shows the financial position of a business, and that the Profit and Loss Account shows how that position has been arrived at. This is true, however, only in a limited sense. To a manufacturer, it is claiming too much for the Profit and Loss Account, because in its ordinary form it does not tell him anything of the kind. We may grant that it tells him what expenditure has been incurred in the conduct of business; it may even exhibit this expenditure in much detail, but when all this information has been examined he cannot ascertain why this expenditure should have produced the sales values which the accounts show it has produced. He may consider the sales values too high or too low, but the accounts do not show him why this should be so.

By other methods, however, the accounts might show this. If, for instance, the classification of expenditure were made from a Costing standpoint, if direct wages were separated from indirect wages, the direct purchases separated from the indirect purchases, depreciation of plant and machinery separated from depreciation of office furniture and fittings; if the rent, rates, and taxes of other establishments were separated from the rent and rates of the factory

—if, in short, the factory expenditure were separated from other classes of expenditure—the accounts might be made to exhibit very valuable information to the manufacturer.

As a matter of fact, although a Costing system, the efficiency of which is safeguarded by periodical agreement with the financial accounts, is very much superior to any other system, a great deal can be done, in the absence of these facilities for agreement, by a more enlightened classification of the expenses shown in the Profit and Loss Account.

It is the general practice of mixing purely factory expense with distribution or establishment expense which has obscured the usefulness of annual accounts from a Costing point of view. There is no reason why an improved accounting classification of expense, and its analysis into separate departments, should not take the place of accounts which in their present form are very much limited in value.

In this way oncost rates for separate departments may be ascertained with something approaching accuracy, and if attempts at Costing go no further than the derivation of oncost rates by analysis of periodical accounts, even this short step will be a longer step than many manufacturers have ever taken in the direction of accurate cost finding.

Detailed Consideration of Accounts.

If we examine therefore the set of *pro forma* accounts on pages 88 to 90, it will be seen that they differ very materially from the common form of accounts.

Taking first the Manufacturing Account, we notice that each element of cost is kept distinctly in view. We have direct material, direct labour, and factory oncost. These three items cover the whole activity of the factory, and the total of these has only to be adjusted by the rise or fall in the work in progress during the period to enable the total cost of finished goods, transferred from the factory to the warehouse, to be ascertained.

How are these several totals obtained? The direct material from stores is the sum of all the direct material requisitions made by the factory upon the storekeeper for the period covered by the account.

The direct labour is the sum of the direct labour expenditure for the period, which is agreed with the sum of all the direct labour charges to individual costs, where the Costing system is sufficiently elaborate to facilitate this agreement.

We next come to the factory oncost. It is assumed in this case that for Costing purposes the factory is divided into three different departments, styled X, Y and Z, and the sum set against each of these departments represents the total charges for oncost made to every "job" passing through these departments for the period.

Under these three heads, therefore, namely, direct material, direct labour, and factory oncost, we have the aggregations of the individual charges made to the work passing through the factory for the period.

All these details are contained in one or two simple accounts in the books. A Work in Progress Account is opened at the commencement of the period. To this account is debited the total material charged to production orders, which sum is reconciled with the total material requisitions on the stores for the same period.

The credit to the Stores Account has therefore its corresponding debit in the Work in Progress Account.

The total charges to production orders for direct labour are also added together, and the sum of these charges credited periodically to the Wages Account, and debited to the Work in Progress Account.

The same operation is gone through for the purpose of ascertaining the sum of the total oncost charges to individual orders.

The sum of these charges is debited to the Work in Progress Account and credited to the Factory Expense Account.

As goods are finished in the factory and transferred to the warehouse the cost records are completed, and the total of these completed costs credited to the Work in Progress Account and debited to Finished Goods Account. The balance of the Work in Progress Account therefore represents the sum of the uncompleted costs of uncompleted work.

Now let us look at the Summary of Factory Expense. Under this summary is marshalled the whole of the factory expense or oncost incurred during the year, classified under the various headings of Building Expense, Power, Plant Maintenance, and others, the constituent parts of which we have discussed in previous chapters.

It will be seen that the total of these expenses amounts to £21,800, and they are apportioned to departments X, Y, and Z, as shown. Underneath these totals is set out the estimated number of working hours in each department during the year.

Assuming the year consists of 300 working days of 8 hours each, the number of possible working hours is therefore 2,400. A deduction from this total is made for contingencies such as lost time by individual workers, short temporary stoppages, and others already discussed. The conditions in each department are assumed to be such as to make the necessary provision for these contingencies unequal, deductions for this purpose being made from departments X, Y, and Z of 300 hours, 200 hours, and 100 hours respectively.

The numbers of separate units in each department are 20, 25, and 10.

It may be assumed that these units are either direct wage-earners, in which case the hourly expense rate shown below is a man-hour rate; or that the units are machines, in which case the hourly expense rate represents the machine-hour rate.

Multiplying the number of hours by the units, we obtain a total number of man-hours or machine-hours in each

department. These total numbers divided into the total departmental expense give an hourly rate per man or per machine.

It has been assumed also that the total factory expense was exactly estimated at the beginning of the period, which of course would not happen in practice.

Turning again to the Manufacturing Account, we shall observe that the total oncost distributed over work done in department X at the rate of 3s. 7d. per hour amounted to £7,470, whereas the total oncost expense for that department was £7,530. The undistributed oncost for the period is therefore £60, which means that the estimated number of working hours in this department was in excess of the number of hours actually worked.

In the case of department Y, the total oncost expense distributed at 4s. 1d. per hour amounted to £11,300, whereas the actual oncost expense amounts to £11,290. The estimated number of hours, therefore, in this department was exceeded by the actual number to a slight extent.

In the case of department Z, the oncost distributed also fell short of the actual oncost expense by £100, for the same reason that the estimated number of hours exceeded the actual number worked in the department.

The item entitled "Adjustment of Oncost" therefore represents the margin of error arising in the distribution of the oncost expense. It is a margin which is relatively unimportant, and it will be seen from the Profit and Loss Account that it has been written off against the cost of goods sold.

Now turn to the Profit and Loss Account. The first item on the debit side is "cost of goods sold," and is arrived at by adding to the stock of finished goods at the beginning of the period the total cost of the finished goods transferred from factory to warehouse, and deducting the cost of finished goods on hand at the end of the period.

The cost of goods sold amounts to £52,000, while the total sales amount to £64,000.

The cost of goods is increased by the amount of the undistributed oncost amounting to £150, and the gross profit representing the difference between the factory cost of the goods sold and the selling price amounts to £11,850.

This gross profit is carried down to the credit side of the account, and the amount received from discounts on purchases added to it. Against these items are placed the distribution expense under the three headings: selling, delivery, and general; then bad debts and discounts on sales, leaving the net profit £6,225.

Anyone at all familiar with Profit and Loss Accounts will realize that this form of account is superior to the common form. It not only classifies the total expenditure of the business in an intelligible way, but shows in a clear manner the total factory cost of goods sold, how this total factory cost compares with the sales value, and what is the extent of the expense of distribution, and the net profit from manufacture. In the common form of Trading and Profit and Loss Accounts, this strict classification of expense is usually absent.

Even when Costing arrangements do not admit of this agreement of all elements of cost with the actual charges to individual costs for the period, accounts may still be drawn up on these lines, and for clearness and simplicity they are a considerable improvement upon the popular form of periodical accounts as usually prepared.

The method of accounting outlined in this chapter provides not only for the record of values entering into the factory and leaving the factory. It provides for the measurement of values through the factory, and the establishment of a complete connection between the inflow and outflow of goods.*

The accounting mechanism necessary to procure this result is described in later chapters.

CHAPTER VII

STOCKTAKING and Methods of Valuation—"Cost or Market" Value—"Factory" Cost the True Basis—Continuous Records of Stock—Control Accounts—Creation of Reserves and their Effect on Cost Accounts—Expenditure on Patterns, Jigs, Tools, and Moulds—Difficulties considered—Allocation of Stores Expense and Tools, Patterns, and Drawings.

CONSIDERATION has now been given to the improved form of annual accounts and the advantages this form has over the ordinary form, reflecting in a clear and concise way all the factors which make up the total cost of production.

The record of transactions summarized in the common form of Profit and Loss Account only has to do with the record of external obligations incurred by or to the business.

But in the improved form of account, every element of cost is kept separately and distinctly in view. *It is the expression, in summarized form, of all the details of individual costs for the period covered by the statement. This should be the single aim of annual accounts.*

Stock-taking and Methods of Valuation.

There are many advantages to be derived from the adoption of this point of view which will become clear as we proceed. Let us consider again the question of stock-taking. In the absence of a system of ascertaining approximate costs, the operation of stocktaking is a difficult and uncertain operation. Although we may define the basis of stocktaking as the ascertainment of the cost or market value of the goods on hand, such a definition can scarcely be considered useful where neither cost nor market value is definitely ascertainable.

A manufacturer may have on hand a large quantity of work in progress. How is the cost of this work to be

valued, and how is it possible to determine whether this value when ascertained exceeds or falls short of the market value? The market value is often non-existent. Where it exists, it is frequently problematical.

The same observations apply to finished goods, for suppose we are able to ascertain their cost, the comparison of this cost with the market value is also impossible in many cases, because no such market value exists. The only adjustment possible in such a case is the reduction of the cost where a fall in the market value of raw material has occurred, or in comparatively rare instances where a competitor has placed upon the market an identical article at less than one's own factory cost.

Many methods are adopted in valuing stock-in-trade, and practices exist which contravene the popular maxim of "cost or market" value. For instance, there is the practice of valuing what is known as the "base stock" at a minimum value. The "base stock" is considered to represent the minimum amount of stock absolutely essential to the conduct of any business.

Take for instance an ironfounder who, no matter what is the state of the market, is compelled to have in reserve a certain minimum quantity of raw material if he is to carry on. If the market price falls, he cannot on that account get rid of this stock, and at the same time maintain his production even at a minimum level. For this reason, a certain quantity of material which is known as the "base stock" is valued for stocktaking purposes at a minimum value, so that the risk of loss through market fluctuations may be provided against. This is undoubtedly commercially prudent, and the practice is well established.

The methods of stocktaking valuation which one finds frequently in use are—

- (1) At cost or market value.
- (2) At the market or selling price less a percentage estimated to bring the value down to cost.

(3) At standard costs usually based upon the costs of a normal year or the average of a series of years.

(4) At the estimated cost of reproduction.

All these methods are based upon theories which in particular circumstances are commercially sound. Each of these methods also has its own effect upon the profit or loss ; and the fundamental principle of all may be broadly stated in this way—that no profits should be anticipated, and that all known losses, whether actual or contingent, should be provided against.

Quite apart from the observance of this principle, however, the accuracy of stock valuations depends upon factors which lie outside this rule. We may grant that cost price is the proper basis for stock valuation in ordinary cases, but the question arises : What is cost, and how is it to be ascertained ?

Factory Cost the True Basis.

A manufacturer will usually agree that *factory cost* is the cost to be adopted as the basis of stock valuation. In that case the accuracy of the valuation will depend very largely upon the method of ascertaining factory cost. The prime cost of an article is usually known with approximate accuracy. It is the method of distributing the factory expense over the factory products which introduces uncertain factors into the ascertainment of a reliable cost.

Very large margins of error are possible in stock valuations, where the methods of distributing the factory expense are unreliable. Particularly is this so in cases where the total stocks on hand of finished or partly finished goods represent a large proportion of the total annual output. The margin of error is negligible where stocks are valued at the beginning and end of an accounting period, even though the basis may be fallacious, providing the stocks on hand at both dates are substantially equal in value.

Where, however, the total of such stocks represents a third of the total output in the first year of a new business, or where the increase in stock represents a third of the annual output, and an error of 15 per cent. in the stock value was made, the net profits calculated on the basis of cost price in that case would be over-estimated to the extent of 5 per cent. As 5 per cent. in some industries would be considered a good average net profit on the cost, this error in the stocktaking valuation would have the result of doubling the apparent profit. If the error in stock value were 5 per cent. only, the effect upon the net profits would be an addition of $1\frac{1}{2}$ per cent., which again is quite a considerable error.

Net profits when calculated on the basis of cost price are usually represented by a very small percentage, and the effect of an error in the valuation of stock upon the ascertainment of this profit may be very considerable.

It is the practice of some concerns to ignore oncost in valuing stock, bringing into the valuation all finished or partly finished goods at prime cost. This again from the point of view of commercial prudence is a safe rule. Methods of this kind, however, cannot be considered to represent any considerable achievement in accountancy. Their application serves frequently to confuse and befog a statement of profit and loss to such an extent as practically to destroy its usefulness as a guide to the ascertainment of periodical profit.

It should be noted also that where stocks are continuously undervalued, the effect upon the ascertainment of annual profit is—

- (1) To under-estimate profits when stocks are rising in quantity.
- (2) To over-estimate annual profits when stocks are falling.

As profit, therefore, should bear some relation to the business done for any period, it will be seen that in the

ascertainment of true profit the basis upon which stock is valued is of very great importance.

What, therefore, should be the basis adopted to secure this result in periodical accounts? To help us in the consideration of this point, let us refer again to the *pro forma* accounts on pages 88 to 90. If we examine these accounts carefully, we shall find the methods of accounting underlying them admit of the ascertainment of the total factory cost of finished goods, and that finished goods at this cost are transferred from the Manufacturing Account to the debit of the Profit and Loss Account.

The first advantage, therefore, is that we have a cost for each finished article, definitely ascertained, which forms a true basis for stocktaking valuation.

Secondly, only stocks of finished goods appear in the Profit and Loss Account, the stock of work in progress remaining as a balance in the Manufacturing Account. The stock of raw materials does not figure in the Manufacturing Account, or in the Profit and Loss Account, but appears only in the Balance Sheet.

It follows from this, therefore, that any variation in the stock value of raw materials from original cost must appear as a separate item in the Profit and Loss Account. If through any cause the original cost value of raw materials is considered to be too high, the amount written off this original cost appears on the debit side of the Profit and Loss Account. On the other hand, if through any cause the original cost value is considered to be too low, the difference between original cost and stock valuation appears on the credit side of the Profit and Loss Account.

The fact also that only stocks of finished goods appear in the Profit and Loss Account is a distinct advantage over the common practice. To each of the articles included in this stock a definite factory cost is attached. If, therefore, for any reason it is considered advisable to reduce this

value, the manufacturing profit is only affected by the extent of this reduction.

The extent of this reduction would also be known, as the balance of Finished Goods Account represents at all times the book value of the stock of finished goods at factory cost. Any reduction of this factory cost must necessarily form the subject of a separate and distinct accounting entry, so that its extent is at once ascertainable.

By these methods, therefore, clear records are always available, which show the extent of every increase or decrease of stock value in relation to the book value, and which also distinguish between purely manufacturing profit and profit due to external causes beyond the control, broadly speaking, of the management.

Another very great advantage of this improved form of account over the popular form is that the stock valuations are not merely dropped into the account, but are ascertained independently of physical stocktaking by the improved accounting methods, of which this improved form is the expression.

Continuous Records of Stock.

By a proper system of stores control the continuous movement of goods through the factory is recorded. The raw materials which are withdrawn from the stores are credited to the stores and debited to the factory. In the same way, wages are debited to the factory and credited to the Wages Account, and oncost is debited to the factory and credited to the Factory Expense Account. The Factory or Manufacturing Account is in this way debited with—

- (1) Material withdrawn from stores.
- (2) Factory wages.
- (3) Oncost.

When finished goods are transferred from the factory to the finished store or warehouse, the Factory Account is credited with the total cost of these finished goods, and,

the finished store or warehouse is debited. Balances will therefore appear in the accounts of the business as follows—

(1) Raw Materials Account ; the balance representing the value of raw materials in store.

(2) Manufacturing Account or Factory Account ; the balance representing the cost value of work in progress.

(3) Finished Goods Account ; the balance representing the cost value of finished goods on hand.

It will be seen, therefore, theoretically, at any rate, that every balance is a balance arrived at by accounting processes.

The advantages of control over every phase of the business which this system of accounting affords are very great. In particular businesses it has resulted in the disappearance of the annual stocktaking and its substitution by a system of continuous check of stores records.

This system entails a method of stores inspection throughout the year, by which the whole of the stock is examined more or less frequently, and the quantity of material actually in hand compared with the quantity as shown in the books. It provides for the continuous elimination from stores values, of waste material, such as material which has perished, or which has become obsolete in pattern or design. The operation of stocktaking is therefore reduced to the extraction, from the stores record, of quantities of goods on hand and their approximate agreement with the Control Account or Accounts appearing in the books.

Control Accounts.

This system of Control Accounts requires some explanation. It is a most useful form of accounting, and has been in use so far as financial ledgers are concerned for many years by large numbers of business houses.

The method is extremely simple. Perhaps if we describe it as practised in connection with a Sales Ledger, its precise nature will be clear.

The basis of the method is the classification of transactions. Suppose we have a Sales Ledger in which appear transactions with customers in England and Wales. As goods are sold to each customer, the amount of the sale is debited to his account from a Sales Day Book or Journal or some modern form of Day Book or Journal.

When the cash in payment of the goods is received from the customer the amount is first entered in the Cash Book, and afterwards posted to the credit of the Ledger Account.

Instead of posting these transactions to numerous individual accounts let us suppose that we post them to one account only. It follows that if we did so, the balance of this account would be equal to the sum of all the balances of all the separate accounts.

It is this simple fact which is the basis of Control Accounts. If the classification of transactions is so arranged that the total amount of sales posted to the individual accounts appearing in the Ledger is readily ascertained, and the total amount of cash received and discounts allowed is also readily ascertained, we are thereby able to keep, concurrently with the detailed accounts, a summary account, or Control Account, the balance of which will be equal to the sum of all the balances appearing in the Ledger.

In this way the keeping of the Sales Ledger is supervised, and it will consequently be known whether a list of balances extracted from the Ledger at any particular date is correct or not, without having to undertake the checking of each individual balance in the Ledger. If the postings to the Ledger have been accurately made and a list of balances correctly abstracted, the total of these balances will agree with the balance on the Control Account. If they do not so agree, a further examination will be necessary in order to find how the difference between the two accounts has arisen.

This method, applied to stores records, is of great benefit. The number of Control Accounts will depend upon the number of separate divisions in the stores which it may be,

considered advisable to observe, and the extent of the detail which may be decided upon also depends upon the nature of the industry.

In many industrial concerns the detailed stores records may be multiplied *ad nauseam*. There are cases in which, on account of the nature of the stores held, the method of continuous stocktaking is impracticable.

Where this is so, the improved form of periodical accounts may still be used. The annual stocktaking would reveal the extent of the differences which have arisen between the value of raw material on hand and the value appearing in the books.

The balance of Work in Progress Account will also differ from the valuation, and the extent of this difference will be known.

Finished Goods Account will also not agree with the valuation, and the extent of the variation will be seen.

Creation of Reserves.

With regard to stock valuations generally, these should be looked upon in the first instance from a strict Costing standpoint, so that our Costing records may not be vitiated by the creation of reserves, and reductions from or additions to original cost. Having ascertained the factory cost of any manufactured article, this article is then handed over to the commercial department, and it is for the commercial department to decide at the period of annual stocktaking whether any reduction is to be made from this original cost, or any reserve created to provide for contingencies which do not concern the factory.

All these reserves should be clearly shown in the books, so that their effect upon the profits may readily be ascertained.

If it is desired to write down a particular asset, make a further provision against doubtful debts of a special nature, provide for depreciation of plant or machinery in excess of

what may be considered an adequate provision : if it is desired to create a reserve against a possible fall in value of raw materials—let all these things be done. Their effect upon the trading result should, however, be clearly shown.

In the examination of accounts, an accountant engaged in the verification of the financial position of a business concern is rather apt to take a different view from an accountant investigating methods of Costing.

A financial accountant, for instance, might conceivably object to the carrying forward of depreciation which virtually takes place when finished or partly finished goods are taken into stock at factory cost. In view of the fact that factory cost includes depreciation, the crediting of profit and loss with goods in stock is equivalent to a reduction of the provision for depreciation. Directors and proprietors of businesses like to feel that provision for depreciation debited to profit and loss is actually set aside.

The same view from a financial standpoint may be urged against the inclusion in stock values of any part of the factory oncost represented by expense of a fixed nature, such as rent or Managing Director's salary, which expenses are incurred whether production takes place or not. The extent of this carrying forward of expense depends on the difference between stocks of finished and partly finished goods at the beginning and end of the period, and the amount involved is generally unimportant.

Expenditure on Patterns, Jigs, Etc.

Another matter with regard to which opinion in the cost department may differ from the opinion in the financial department is that of capital expenditure incurred within the factory. The expenditure of a capital nature incurred by the factory itself is often considerable, and the question has to be decided whether oncost should be reckoned in expenditure of this nature.

From a strict Costing standpoint there appears to be no ,

reason why oncost should not be included. The expense of producing tools, patterns, and dies usually involves oncost expense of a special nature. The same is true with regard to building additions, a group of bricklayers and carpenters being usually supervised by foremen. The use of machinery is frequently necessary in connection with work on plant or buildings, and there seems to be no reason why the machine rate, which includes oncost expense, should not be charged to work of this nature.

From the financial standpoint, however, there may be good reason for cutting down the book value of such capital expenditure, and it is desirable, therefore, to determine the extent of the writing down which should be effected. This is always necessary with regard to patterns, tools, and jigs, the useful life of which is indeterminate, and additions to capital incurred by the factory itself should be subjected to review on the preparation of the annual accounts.

Difficulties Considered.

Turning again to the *pro forma* accounts, the omission of certain items of importance from the classification of factory expense, such as the cost of drawings, patterns, jigs, tools, and moulds will be noted.

These items are representative of expense, the allocation of which presents peculiar difficulties, because with all capital expenditure of this nature its period of usefulness is indeterminate and uncertain.

Peculiar difficulties also arise in connection with the allocation of the stores expense. These difficulties may be considered conveniently here.

Allocation of Stores Expense.

First of all, with regard to the stores expense, it will be observed that in the classification of expense which has been given, the item Stores is included in the factory expense or

oncost, and having been placed there, it would accordingly find its way to individual costs in the percentage based on direct labour, or as a fraction of the man-hour or machine-hour rate.

It might be thought that the stores expense is more directly related to the material expense than to any other element of cost. This, however, is not necessarily so. The nature of the services rendered to the factory by the stores should be borne in mind, as the cost of the stores records and of the labour employed in the stores may be more directly related to the number of "jobs" passing through the factory than to the value of the material handled in the stores.

It is, however, a difficult problem to allocate the expense of stores on the basis of any factor of production costs, whether it be the material factor or labour factor.

Suppose we transfer the item Stores to the General Establishment Expense, and allocate this on the basis of the total factory cost, exclusive of stores expense, are we likely to get a truer incidence by this method? All of course depends upon the nature of the business.

In the man-hour or machine-hour methods we have methods which allow of more elasticity in the allocation of the stores expense, either in the light of the services rendered to each workman or class of workmen, or to each machine or class of machines.

In the case of material of great bulk and weight, the cost of storing and handling is high. The fact that this material is bulky or weighty is by no means necessarily expressed in the value. In fact the allocation of the stores expense on the basis of value seems to be the basis which is least likely to secure an equitable distribution.

Articles also which are small in dimension are frequently very costly, but there seems to be no reason why they should, on this account, bear a larger proportion of the stores expense.

This allocation presents special problems in different industries, and it is scarcely possible to lay down any general rules. Its distribution is always a matter of difficulty, and the cost accountant must use his discretion as to the method applicable in any particular case.

In the pottery trades the cost of storing, grinding, and mixing pottery materials are closely allied; therefore, the varying conditions of each case have to be studied carefully in order to determine the basis of allocation.

Generally speaking, the allocation of stores expense is distributed over the various departments of a business as equitably as circumstances permit, by the division of this expense and its inclusion in the oncost charge of each department, in proportion to the stores services rendered.

The advantage of the man-hour or machine-hour rate method in this connection is that sub-divisions of departments into classes of men or machines, bearing different proportions of stores expense, may be more easily effected.

Tools, Jigs, Patterns, and Drawings.

The treatment of the expense of tools, jigs, patterns, and drawings is also a matter of difficulty. If a manufacturer receives an order for a special product, or a definite number of specially manufactured articles, for which no further demand will arise, provision for new tools, patterns, and drawings in the costs presents no special difficulty. The ascertainment of the cost of a tool or jig is no more difficult than the ascertainment of the cost of any other manufactured article.

The special difficulty is not related to the ascertainment of cost, but to the apportionment of that cost over the output.

In the case cited no problem arises, as the provision of tools would definitely form part of the cost of producing the special articles. The manufacturer, however, would still have the tools on the completion of the work, and if he had reason to anticipate further calls for the same

manufactures, they would for that reason be of some value.

This really is the root of the problem. Expenditure on jigs, tools, and patterns we may consider to be capital expenditure, but capital expenditure the useful life of which cannot be determined in advance. Its value is strictly limited to the time the demand is maintained for the articles, in the manufacture of which the use of the tools is essential. The moment the demand ceases the value of the tools disappears.

This problem is often of great importance to the manufacturer. He may be bidding for trade for which a competitor is fully equipped. If in such a case he includes the cost of the necessary tool equipment, he is jeopardizing his chance of securing the business. On the other hand he is unable to estimate, even approximately, what the future demand for the particular articles may be, and therefore cannot accurately spread the cost of this special equipment over the output of the articles.

It is readily seen that in a problem, the aspects of which are so indeterminate, the formulation of a general rule is impossible. The plan adopted by many manufacturers, which appears to be a safe plan, is to record on each cost sheet of articles for which special equipment has been necessary the total cost of such equipment. The question whether part of the cost or the whole cost should be debited to the customer is a matter for consideration in the light of special facts and circumstances.

The whole of the expenditure incurred in providing these auxiliary tools should be separately recorded, and credited with all direct charges made to customers. The balance should be carefully scrutinized from time to time, and values which have disappeared through the decline or total cessation of demand should be written off. The charges so written off will come into the oncost charges of the various departments.

The allocation of these charges to individual costs is again a matter of some difficulty and here the superiority of the machine-hour method over other methods becomes apparent, the equitable distribution of this tool charge being effected more easily as a general rule in relation to machines than to any other factor.

CHAPTER VIII

THE Mechanism of Cost Accounting—The Objects of Manufacturing Accounts—Popular Views of Cost Accounting—The Routine of Purchasing—Purchase Requisitions—Purchase Records.

Mechanism of Cost Accounting.

It now remains for us to consider in greater detail the mechanism of cost accounting.

In the majority of manufacturing businesses in this country, cost accounting in the strict sense of the term is not practised. Although Costing is often the function of a separate department, the Costing performed in that department is usually confined to the allocation of direct labour and materials to different orders, and the addition to prime costs of a percentage based upon the cost of direct labour, or labour and material, to cover oncost.

These Costing records, however, have usually no connection with the accounting system of the business. As a general rule no reconciliation is attempted between material charged to costs and material which has actually been expended, as shown by the periodical accounts of the business. No reconciliation is made between the total wages expenditure and the total wages charged to individual costs.

The same remarks apply to the oncost expenditure, no reconciliation being made between the actual oncost expense and the total oncost expense charged to individual costs.

The Costing records are therefore merely memoranda, or estimates, and a large percentage of them exceedingly inaccurate estimates.

The accounting records of most manufacturing businesses are confined to the merchanting aspects of the business, the cycle of transactions being cash to purchases, purchases to sales, and sales back again to cash.

A cost accounting system of reasonable efficiency should go beyond this. In addition to the merchanting aspect of the business, it should reflect also the whole of the factory operations.

Objects of Manufacturing Accounts.

The manufacturing accounts should be so formulated as to ensure—

(1) The proper assembly or classification of the elements of cost.

(2) That every financial period bears its proper proportion of expenditure.

(3) The apportionment of total expenditure on an equitable basis to each of the articles produced.

That is to say, so much expenditure is incurred, so much material, labour and expense has gone into the factory. Articles representing a combination of this expenditure, in varying proportions, emerge from the factory, and the Costing mechanism should enable us to measure approximately the varying proportions incurred in the production of every manufactured article.

With these three essential features in mind, it is proposed then to describe the accounting mechanism which it is necessary to set up to secure the essential results, always keeping in view the fundamental principles already considered, and suiting the accounting mechanism thereto.

With these objects in mind, we will describe a Costing system which is full and complete, capable of yielding results in the form of the improved annual or periodical accounts, the advantages of which over the common form have already been discussed.

There are, of course, many different forms of manufacturing industry, and it is therefore not practicable to lay down general rules for all cases. In many businesses it might be possible to adopt the methods now to be described practically without modification. Any attempt,

however, to impose the same methods in different circumstances might be unsuccessful.

In actual practice it is, generally speaking, far better to introduce Costing reforms gradually than to attempt the installation of a system involving very drastic alterations in the clerical routine of the factory. If we confine ourselves first of all to the improvement of general accountancy methods by classifying all expenditure from a strict Costing standpoint, afterwards passing on to the improvement of methods of handling purchases, stores, and factory orders, we shall find, in these fields alone, plenty to reward our first endeavours.

Popular Views of Cost Accounting.

The popular view regarding cost accounting is that it is something inseparably connected with endless forms and cards, entailing a vast amount of clerical labour and irksome routine. It can be made to answer completely to this description, but by no means necessarily so. It does involve an amount of clerical labour, but with a properly devised system, the expenditure should not outweigh the benefits, and may be regarded as expenditure of truly economical character.

One often finds that the bulk of the clerical work involved in cost keeping is already being done, but it is not co-ordinated so as to yield the information which can be derived from it. That is the position in many businesses in the country at the present time. Much routine work is going to waste, because ways and means of rendering it much more serviceable are not perceived.

Routine of Purchasing.

First of all, then, we will turn our attention to the routine connected with the purchasing of goods, which is the initial step in the manufacturing process.

Many manufacturers still adhere to the old method of

making purchases in more or less haphazard fashion, no continuous record of stock being available for their guidance. Such methods are not conducive to economy of capital employed in the business, which is after all the essence of good management.

The method which one finds becoming more and more common is to fix in advance the minimum amount of each kind of store to be kept in hand. We are referring now to materials in store, the term "purchases" covering actually a somewhat wider field than the purchasing of material for current use.

When the stock falls below the minimum quantity fixed, it is the duty of the storekeeper to notify the fact to the purchasing department. The minimum quantity to be carried should be fixed with due regard to all the conditions so far as they are known, such as the source of supply, the time required for delivery in normal cases, and also the normal consumption of the factory.

The movement of stores enables an intelligent storekeeper to judge whether the minimum quantity originally fixed might be increased or decreased, and the form upon which notification is sent by the storekeeper to the buyer, or the purchasing department, sometimes provides space for storekeeper's observations in this connection.

Purchase Requisitions.

There are several sources from which purchase requisitions arise in addition to the ordinary requisitions from the stores. Much depends upon the nature of the business as to the methods most suitable for securing supplies.

In some businesses it is found convenient to prepare a statement of the material required in connection with each order received, and to send the statement to the storekeeper. The storekeeper then notes upon the statement the quantities of the various materials which are in store, at the same time indicating the material which it will be

necessary to order from outside sources. The purchasing department then places orders for the necessary quantities, so that the execution of the order may not be delayed through lack of material.

In some cases, materials in store are definitely allotted by the storekeeper to the orders received by him in this manner, so that although the materials are still in the stores they are considered to be definitely allotted and not available for other orders, except in special circumstances. The storekeeper having noted these allotments of materials under definite order numbers, then awaits their requisition by the foremen of the departments concerned with the execution of the orders.

Purchase requisitions usually fall into three main divisions. These are—

(1) Ordinary requisitions from the stores to replenish quantities which have fallen below the minimum.

(2) Requisitions for goods urgently required, no stock being available.

(3) Requisitions for special materials for the special requirements of customers, regarding which, possibly, conditions as to quality, date of delivery, and source of supply, have to be satisfied.

A most efficient routine method is to make out copies of requisitions in triplicate. One is retained by the person making the requisition, who may be a storekeeper or departmental manager or the manager of the factory equipment. The two other copies are forwarded to the purchasing department, which proceeds to arrange for the supply of the necessary material. The order having been placed, and the probable date of delivery ascertained, the order number, date, and name of supplier are written on one of the requisition forms, together with the date of delivery, and filed under the name of the requisitioner or his department. The second copy is returned to the requisitioner, after the insertion of probable date of delivery.

The requisitioner files these in datal order, so that he may hasten delivery where promises are not kept.

Purchase Records.

The receiving department records the details of all goods received, which are compared with the invoices.

Invoices having been properly checked and passed for payment are usually entered into a book variously described as Purchase Journal, Purchase Day Book, Abstract of Purchases, Bought Journal, or Day Book. These entries are made daily, weekly, or monthly according to convenience.

The columns of the Purchase Journal are arranged in this order, viz.—

- (1) Date of invoice,
- (2) Name of supplier,
- (3) Invoice number,
- (4) Folio number,
- (5) Amount,

after which there usually follow columns more or less numerous in which the separate invoice totals are analyzed under accounting classifications. Each invoice, or sometimes the total of the invoices from the same supplier, is then credited to the supplier's account in the Purchase Ledger, and the total of each analysis column is debited to its proper account in the Nominal Ledger or other Ledger.

Where Control Accounts are kept, and it is desirable that they should always be kept where possible, the total of the month's invoices credited to the Bought Ledger should be credited to the Bought Ledger Control Account.

The important part in the arrangement of a Purchase Journal is the classification or analysis of the total. The common method is to follow the ordinary accounting classifications as they appear in the Trading Account

of the business. Care should be taken to arrange: (1) That the analysis should facilitate the keeping of the Stores Control Accounts; (2) That where purchases are not taken into store, the analysis should provide for the allocation of such purchases to the proper element of cost.

A convenient form of Purchase Journal provides for the following, viz.—

- | | |
|-----------------------|--------------------------|
| (1) Date of invoice | (6) Purchases for stores |
| (2) Supplier's name | (7) Works expense |
| (3) Invoice No. | (8) Selling expense |
| (4) Folio of Ledger | (9) Plant and Equipment |
| (5) Amount of invoice | (10) Sundry Accounts. |

An analysis of this kind facilitates the collection of the various elements of cost. It may be necessary to sub-divide the heading of stores to obtain totals of purchases for stores which will agree with the stores arrangements, and facilitate the keeping of Stores Control Accounts for separate Stores Departments.

Also under the heading of selling expense we might find it convenient to make further sub-divisions, in order to secure the classification of this expense under various headings. It may be convenient also to sub-divide the column headed "Works Expense." This will include all purchases which do not go into the stores to be issued as required, but which may be considered to have been consumed when purchased; as, for example, Repairs to Plant, Painting and Cleaning of Factory, Repairs to Light Installation, and Power Charges.

The sundries column of the Purchase Journal may be utilized for purchases of a special nature, chargeable direct to the costs of particular contracts. Other items may also be dissected to this column, and analyzed again periodically under suitable headings.

The essential requirement in arranging the classification of purchases in a Purchase Journal is the distinction first

of all between goods passing into stores, and goods which do not, and the classification of purchases not represented by stores, under analyses which preserve the main divisions of cost, and facilitate their collection and allocation.

Purchases made for cash are not passed through the Purchase Journal as a rule. It is a common practice to do so, but a practice which is often unnecessary. No recording of credit is necessary in such cases, and therefore a Bought Ledger Account can only serve the purpose of exhibiting the extent of the cash transactions in any particular case. Although this may be useful information on occasion, it is not the primary object of a Ledger Account.

Where such transactions are recorded in the Bought Ledger there is a marked tendency for the accounts to become irregular. Payment being made frequently on invoices, invoices are not available for Purchase Journal purposes, and in fact do not get there at all until it is discovered that the Bought Ledger Account shows debits of cash against which no credits for goods appear.

Speaking generally, therefore, it is preferable to record these transactions only in the Cash Book, and to secure their analysis under proper classifications by providing the necessary columns.

CHAPTER IX

STORES Records—Various Methods of Keeping Stores Records
• Considered—Degrees of Detail—Reconciliation of Value of
Stores Received with Purchase Journal—Control of Stores
Issued—Requisitions—Charging Requisitions to Costs—Classifi-
cation of Stores Issued—Verification of Stores Balances—
• Continuous Inspection.

Stores Records.

WE will now proceed to consider the accounting methods involved in the process of store-keeping, so that the inward and outward flow of stores may be properly recorded, and the rise and fall in stores values measured at any given moment.

Efficiency in store-keeping and storekeepers varies greatly. In large numbers of businesses, some attempt is made to keep continuous records of material passing through the stores, but in the majority of cases these records do not form part of the accounting system.

In many cases also store-keeping is carried on with great difficulty owing to the insufficiency of stores accommodation. Much time may be lost by workmen requiring material if the stores are not also conveniently situated. For this reason materials have sometimes to be taken from the stores in bulk and placed in the workshops themselves. Where an overflow of raw materials into the workshops takes place, the storekeeper can scarcely be held responsible for materials, the supervision of which cannot, under the conditions stated, be complete.

These matters, however, are largely questions of administration. For our purpose let us assume that the stores accommodation is adequate.

Methods of Keeping Stores Records.

Methods of store-keeping vary also according to the nature of the business. There are some businesses in which

the different kinds of material used are few in number. The keeping of separate accounts showing the movement inward and outward of each kind of material does not therefore involve much clerical labour.

In such cases, movements of stores usually take place in relatively large quantities. If the Purchase Journal, therefore, is suitably analyzed, the posting of these Store Accounts from the Journal is a simple procedure. Each account is debited with the quantity and value of each kind of stores purchased. Each account is also credited with stores withdrawn by requisition, and the corresponding debit posted to the Work in Progress Account.

In all other methods there is one central idea. First of all we set up a Stores Control Account, or a series of Stores Control Accounts, where the nature of the stores admits of separate and distinct departmentalization or classification.

The Stores Control Account is the key to the whole stores procedure. This account is charged with the total of all goods received, and credited with all goods withdrawn for manufacturing purposes. The balance, therefore, represents the value of stores in hand at any time.

Sometimes the purely accounting mechanism finishes there, the Stores Control Account receiving its debits from the Stores Received Book and its credits from the Stores Issue Book.

We should, however, go further than this as a general rule. The balance of such an account, if accurately kept, would show approximately the rise and fall in stores values, but is not easily susceptible to verification. It exhibits to us the total value of stores, but it throws no light upon the nature of the stores held. To obtain details, the operation of stocktaking would be necessary. Assuming that stocktaking were undertaken and completed, and that the value of stock on hand so ascertained differed materially from the value as shown in the Stores Account, how should we proceed to reconcile them? It would

entail the dissection of the Stores Account into separate accounts of each kind of store received and issued, and the comparison of the respective balances with the balances shown on the stock-sheets.

In the majority of cases this would prove a most laborious process, and probably no satisfaction whatever would be derived from the results.

A more satisfactory method is the keeping of subsidiary accounts of the movements of each kind of stores, the aggregated balances of which will agree with the balance shown on our Control Account.

Degree of Detail in Records.

The degree of detail to be observed in the store-keeping records is a matter of great importance. There are manufacturing concerns dealing with many thousands of products, some of which are issued in small quantities of very little value. In these circumstances it is often difficult to devise ways and means of keeping stores records the expense of which does not outweigh the benefits. It is often found, however, that by ruling out the less important items of stores the number of separate accounts necessary is very materially reduced.

We might, for instance, have three thousand different kinds of stores which it is possible to divide into two or three hundred separate accounts of more important stores, and also a number of accounts dealing with classes, or groups, of the remaining items. The accounts of these remaining items may be kept only in summary form.

In this way, therefore, the risk of important discrepancies arising between the Stores Control Account and the detailed accounts is reduced, as the accounts dealing with the bulk of the stores' value are capable of being readily checked.

With some small stores an accurate record of their movements is practically a physical impossibility. For instance, take screws and nuts of small size, and relatively

little value. The differences in size are small. Many storekeepers find, notwithstanding the exercise of reasonable care, that these stores get mixed up on the stores cards and in the bins themselves. Attempts, therefore, to keep detailed accounts of each size frequently prove futile.

As a matter of fact, screws and nuts and other similar stores of small value are frequently handed out without formal requisition, and in some cases placed in the workshops themselves, where free access is possible.

In this case, the Stores Account records the total quantities and values of such stores received, and the quantities and values of requisitions by responsible persons for use in the workshops. The allocation of these small stores to individual orders is usually effected through the medium of the oncost charge.

The arrangement of the necessary stores routine is a matter for thoughtful consideration, and much depends upon the nature and value of the stores themselves as to the degree of detail to be observed in store-keeping records. The best course, therefore, may be to describe in more or less detail the full system, leaving it for individual judgment to decide what part of the record might be cut out, or summarized, or condensed, in particular cases.

First of all, then, in order to facilitate the agreement of the Stores Control Account with the detailed Stores Accounts, the mechanism should provide means of reconciling separately the two sides of the account.

The storekeeper should be provided with a copy of all orders for materials placed by the purchasing department, so that goods when received may be compared with the original order. The storekeeper then makes out an Advice Form of Goods received, retaining a copy for himself, and forwarding a duplicate to the purchasing department to be checked with the invoice. The storekeeper is advised by the purchasing department of the prices charged for materials, either by means of actual invoices

passed to him or by completion of the "Goods Received Note" passed by the storekeeper to that department, and its return to him after certification of the invoice.

Reconciliation of Stores with Purchase Journal.

These "Goods Received Notes" are then entered by the storekeeper into a Stores Received Book, either in detail or in summary form, or in totals daily, weekly, or monthly. Assuming, for our purpose, their entry in detail, the total cost of stores received, as shown by the Stores Received Book, is then capable of reconciliation with the stores column of the Purchase Journal from time to time.

The Stores Received Book then forms the basis from which the detailed Stores Accounts are posted, receipts of stores being charged to their respective accounts, either direct from the Stores Received Book, or from the Goods Received Notes of which this book is a summary.

The detailed Stores Accounts usually contain the following information, viz.—

- (1) Quantity and value of goods received.
- (2) Quantity and value of goods requisitioned or issued.
- (3) A balance column showing balance of stores in hand.

A practice has already been mentioned, which is fairly general, of definitely allotting to specific orders the materials required, and reserving them for subsequent requisition under this order number. This practice is adopted by firms who find it convenient to prepare a detailed specification of the material required for the execution of each order. The specification is forwarded to the storekeeper, who marks upon it the material available, and the material for which purchase orders should be placed. The storekeeper also notes on the stores cards the material allotted by him to such orders.

This procedure is not convenient to all businesses. Nevertheless, it is advantageous to be able to look ahead

of day-to-day requirements, and place orders for material in as prudent a way as possible.

Where this routine is found convenient, the Stores Account is ruled to show the following details, viz.—

- (1) Quantity of material on order.
- (2) Material received (quantity and value).
- (3) Material issued (" " " ").
- (4) Balance in store.
- (5) Allotments or Appropriations.

As orders are fulfilled, the quantities in the material on order column are reduced. On the other hand, as regular requisitions come forward and issues take place, the quantity allotted or appropriated to definite orders is also reduced.

The information to be gathered from such a card is very comprehensive. The balance of stores on hand can be compared at a glance with the quantity appropriated for particular orders, but not yet issued, and if it is seen that their issue will reduce the balance below the minimum quantity to be carried, then an examination of the columns containing particulars of material on order will show whether the orders on hand are adequate. Where fulfilment of orders cannot readily be planned, in advance, these details would not serve much purpose.

We have now, therefore, provided the necessary mechanism for recording all receipts of material into stores. The Goods Received Book is kept by the storekeeper in such a form as will facilitate its agreement, in total, with the total of the Stores column in the Purchase Journal.

Control of Stores Issued.

Stores are mostly issued on the authority of formal requisition. The requisitions contain the necessary particulars of the stores, such as Quantity, Description, Order or " Job " No. to which the material is to be charged, Department No. or Symbol, Date, a space for the initials

of the issuing storekeeper, and the signature of the person receiving the material.

Pricing of Requisitions.

The requisitions having been made, and the stores having been issued, the next step to be taken is the pricing out of these requisitions. At this point many difficulties arise, and the necessity for competent and careful store-keeping is here emphasized.

At first it might be thought that the actual cost of material forms the most satisfactory basis for pricing materials issued to the factory. This, however, is not often practicable, and where practicable it is not usually desirable. Where purchase prices fluctuate, either on account of market conditions or because of the different sources from which supplies are drawn, the identity of materials acquired at different prices is a matter involving irksome and impracticable routine, for the point at which quantities, acquired at the same cost, are exhausted is difficult to determine by routine methods.

This question should also be looked at from the standpoint of final cost. When the market price of materials has risen or fallen, it is often expedient, as well as convenient, to charge materials to individual costs either above actual cost or below actual cost as the case may be; and as charges to individual costs are determined most conveniently through the medium of the stores requisitions, it is at this point that the question should be considered.

The bases commonly adopted in charging materials are—

- (1) Market value.
- (2) Average price per unit.
- (3) Average cost per unit.

The current market price often provides the most convenient basis, because it falls into line with the general commercial practice of increasing or decreasing selling prices according to the state of the market.

There is this disadvantage to be mentioned, however, with this method. The date at which requisitions of material are made is often considerably removed in point of time from the date of completion of the work for which the material was required. It might, therefore, be necessary, particularly in the case of goods made for stock, to review again the price at which the material is charged, adopting the market value at the date of completion of manufacture.

In such a case, therefore, we have two costs, neither of which is true cost.

Where it is the practice also to add establishment or selling and distribution charges as a percentage on the total factory cost, the method of fixing this percentage should be borne in mind. This percentage is usually ascertained from the periodical accounts, the relation of the total establishment charge expenditure to total manufacturing expenditure being determined.

If, for instance, the total manufacturing expenditure for the period upon which oncost percentages are based amounts to £100,000, and the establishment charges amount to £10,000, the establishment charges would then be 10 per cent. of the factory cost. That is to say, the actual expenditure of an establishment charge nature is 10 per cent. of the actual expenditure in labour, material, and factory oncost. The addition of 10 per cent. to the factory cost of an order therefore presupposes that the material charged to factory cost is charged at actual cost.

The adoption of market value in place of actual cost upsets the relation which we have in this way determined between factory cost and selling cost. The importance of the difference arising in this manner depends upon the difference between the rate charged for material and the actual cost, and also upon the proportion of the material cost to the total factory cost.

To take an extreme case, suppose the market value of the material was double the actual cost, and that the

proportion of the material to the total factory cost was a half. The establishment charge percentage would in that case be more accurately provided by an addition of $7\frac{1}{2}$ per cent. instead of 10 per cent.

In the majority of cases, this point would not be of much importance, but there have been cases where total costs have been affected materially by this consideration.

It is advisable from all standpoints, except in very special circumstances, to arrive at total costs which reflect approximately the actual expenditure, and which do not introduce factors tending to disturb the relative standards upon which the costs are based. For this reason a method which ensures the charging of material at actual cost is preferable to any other method.

The adoption of average cost per unit is probably the best method from this standpoint. Some firms make a practice of adopting the average costs ruling in the preceding year. This is a simple rule, but its effectiveness is diminished where fluctuations in market prices are at all considerable. Even through the war period there were firms who stuck to this principle, with the result that where the ascertainment of an approximately true cost had become important, for the purpose of fixing a selling price, Costings so prepared always had to be revised.

* A better average is the average cost of the current period. Suppose we commence the period with a stock of 100 articles costing 1s. each. When this stock is depleted to 50, and another quantity of 50 is then purchased at 1s. 3d. each, the average cost would then be 1s. $1\frac{1}{2}$ d., and our requisitions of this article should henceforward be charged to costs at 1s. $1\frac{1}{2}$ d. each, until another change of purchase price necessitates another adjustment. In this way the disbursement of the total cost of materials is always assured, and it forms as simple and as practical a rule as any rule can be.

* The method of charging out material at the average

price does not ensure the arithmetical accuracy which charging at average cost does. Under the average price method, the price is changed whenever a new purchase at a different rate is made, without reference to the relation of the quantity on hand to the quantity newly purchased. The method has, therefore, nothing which particularly commends itself.

The most convenient time to determine changes in prices is at the time of posting "Materials Received" from the Stores Received Book (or its equivalent) to the individual Card Accounts. At this point of time the balance of stores on hand at the old price is readily ascertained, as also the average cost of the new store when combined with the cost of the old. This new price should then be entered in the price column on the card and also in a column provided for price changes in the Stores Received Book. Both changes in price and the introduction of entirely new classes of stores should be noted in the Stores Received Book, so that a Price Index Book or Price Register or Index may be kept quite up to date.

The need for an independent record of ruling prices outside the record on individual Stores Accounts is usually felt, because of the inconvenience of posting Stores Issued or Requisition Notes to the credit of individual Stores Accounts, and at the same time pricing the Requisition Notes themselves. Those who have had practical experience of posting stores records in busy stores will know that this apparently simple procedure is impracticable, and tends to create clerical errors in the posting operations.

An additional reason for making the pricing of requisitions and posting of requisitions two separate and independent operations is the advisability of checking all price changes before making use of them.

A stores index which provides a record of current prices is a useful and time-saving expedient in most stores. It is kept up to date through the medium of the Stores Received

Book, as already explained, and enables Stores Issued Notes to be priced without reference to individual stores cards. The Stores Index should also be a guide to the general classification of the stores under convenient classification symbols, or letters. It should furnish a reference number for each kind of stores in each class, which number should indicate the situation of the bin in the stores department.

Charging Requisitions to Costs.

Regarding the treatment of requisitions, these should first of all be numbered sequentially and priced, and daily or weekly totals of the requisitions ascertained, preferably by means of an adding machine, where the volume of stores transactions is great.

These totals are then entered provisionally in the Stores Issued Book and the requisitions are handed to a stores ledger clerk, who proceeds to sort them in the order most convenient to himself and post them to the credit of the individual Stores Accounts.

It is possible that in the operation of posting, errors in the pricing of requisitions will be discovered. These will be noted by altering the requisitions. Each of the requisitions should also be marked with an indication that it has actually been posted. The requisitions are then arranged in their original numerical order. Any necessary adjustment of the totals of these requisitions is made in the Stores Issued Book, and the notes are handed over to the cost department for Costing purposes.

Provision is usually made in the Stores Issued Book for a suitable analysis of total stores issued, for it must be remembered that material issued from the stores is not all chargeable to the costs of saleable articles. Stores such as files, cotton waste, oil, and other sundries form part of the indirect expense of the business.

• In addition to this class of stores, materials may be issued

in connection with additions to the equipment of the business, such as plant additions and extensions to buildings.

An analysis of stores issued into these three divisions at least is therefore necessary. Quite possibly a fourth division may be necessary, to include stores issues which are correctly treated as part of the selling and distribution expense of the business. A further sub-division showing stores issued to different departments of the business will in most cases also be found convenient.

An illustration of a Stores Issued Summary will be found on the opposite page.

Classification of Stores Issued.

The Stores Issued Book will therefore show in summary form this information, viz.—

- (1) Date of issue of stores,
- (2) Total amount of stores issued ;

together with an analysis of this total under four heads, viz.—

- (a) Issues of stores chargeable to direct costs.
- (b) Stores issued for plant additions.
- (c) Issues of stores, the cost of which forms part of the indirect factory expense.
- (d) Issue of stores forming part of the selling and distribution expense of the business.

The Stores Issued Book provides us with the total of the postings made to the credit of the individual Stores Accounts. This total is subsequently reconciled with the material allocations made in the cost department.

The Stores Received Book total being reconciled with the total purchases of stores as shown in the Purchase Journal, and the Stores Issued Book total being reconciled with the total charges to costs, the sources of the debit and credit postings to the Stores Control Account are in this way verified, and the total balance, as shown on the Stores Control Account, may be taken to represent the actual cost value of the stores on hand.

SUMMARY OF STORES ISSUED FOR

FOUR WEEKS TO19 . .

Order Numbers	Description.	1st week.	2nd week.	3rd week.	4th week.	Total.
	<i>Production Orders—</i>	£	£	£	£	£
	Department No. 1 . . .					
	" 2 . . .					
	" 3 . . .					
	Total					
	Plant Addition Orders .					
	Orders for Special Repairs					
	to Plant and Buildings					
	Orders for alterations .					
	Total					
	<i>Stores Issued to Factory</i>					
	<i>on Standing Orders, viz.</i>					
	Building Repairs—					
	Power House . . .					
	Stores . . .					
	No. 1 Department . . .					
	" 2 " . . .					
	" 3 " . . .					
	Power Expense—					
	Cleaning Materials					
	and Sundries . . .					
	Supervision Service—					
	Repairs to Office Fur-					
	niture					
	Stores Service—					
	Repairs to Equipment					
	Plant Repairs—					
	No. 1 Department . . .					
	" 2 " . . .					
	" 3 " . . .					
	Sundries and Oil for					
	Cleaning Plant—					
	No. 1 Department . . .					
	" 2 " . . .					
	" 3 " . . .					
	etc., etc.					
	Total					
	<i>Selling and Distribution</i>					
	<i>Expense, viz.—</i>					
	Petrol for Motor					
	Vehicles					
	Timber for Packing					
	Cases					
	Paper, String, Boxes,					
	and other Packing					
	Materials, etc., etc. .					
	Total					

The Standing Order Numbers or Symbols are inserted here.

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Briefly reviewing, then, the mechanism for stores control, we see that the Goods Received Note which the store-keeper makes out on receipt of goods into store, after being compared with the invoice for these goods, is entered either in detail or in summary form into the Stores Received Book; and the total of stores received as shown by this book is reconciled with the Stores column in the Purchase Journal for the same period.

Provision is made in the Stores Received Book for noting the issue price of any new kind of stores, and also for changes in price due to rise or fall in the cost of fresh stores, as compared with those in hand. From these particulars in the Stores Received Book, the stores index is kept up to date with regard to price changes.

From the Stores Received Book, also, postings to the debit of individual Stores Accounts are made.

Requisitions Notes or Stores Issued Notes containing details of the material handed out from the stores are first of all numbered, priced, and extended, and then posted to the credit of the individual Stores Accounts. The totals of these issues are entered into a Stores Issued Book, and this total analyzed under the various classifications just described. The requisition notes are then handed to the cost department to be charged to individual costs, or to the indirect expense of the business, as the case may be. The total of these material allocations is agreed with the total of the Stores Issued Book.

If this procedure has been followed, the Stores Control Account should reflect truly the cost value of stores in hand from time to time.

Verification of Stores Balances.

The verification of the balance of the Stores Control Account cannot be considered complete, however, merely because the two sides of the account have been verified in the way described. Reference has previously been

made to the method of continuous verifications of stocks on hand. This method takes the place of the periodical stocktaking which most business concerns still find essential. The verification takes two forms—

(1) The reconciliation of the balance of the Stores Control Account with the sum of the balances on the individual Stores Accounts.

(2) The verification of the balances shown on the individual Stores Accounts by frequent and methodical inspection of the stores themselves.

This verification, which should be regularly performed, has a very wholesome effect on those engaged in the work of receiving and issuing stores, and will always induce greater care in the observance of the essential routine of store-keeping.

The relation between the Stores Control Account and the individual Stores Accounts is similar to the relation existing between a Sales Ledger Control Account and the individual Sales Ledger Accounts. Reconciliation of these is theoretically simple. Those, however, who have been engaged on such work know very well that at times the reconciliation is effected only with difficulty and after much labour.

The absolute reconciliation of a Stores Control Account with individual Stores Accounts is usually more difficult still. We might, indeed, say that, in stores containing thousands of different kinds of material, their exact reconciliation is only possible with a well trained and efficient store-keeping staff. Much patience is usually necessary when the organization of complete stores control is first attempted, and the attempt should not be abandoned because first results are somewhat discouraging.

The discrepancies which are likely to occur in Stores Accounting are broadly divisible into two classes: First, there are those which occur through posting errors; and, secondly, those which are due to incorrect issue, or to the issue of stores without formal requisition.

Unless we are able to effect the reconciliation of the Stores Control Account balance with the sum of the balances on the individual accounts, it is impossible to distinguish between these two classes of errors. That is to say, a discrepancy arising through incorrect account-keeping is indistinguishable from an actual surplus or shortage of stores.

If, however, the Control Account balances with the sum of the individual balances, any discrepancy discovered by actual inspection of stores and comparison with ledger balances is evidently due to issue of stores without authority, or to incorrect issues.

Clerical accuracy is therefore of first importance. For this reason the use of office machinery, apart from its special suitability to the clerical work of store-keeping, is desirable.

The volume of work involved in store-keeping is often very considerable, but the judicious use of mechanical devices for calculating purposes is extremely helpful and economical. The benefits also which accrue from methodical store-keeping, in economy of capital invested, in the saving of time secured by prompt attention to the requirements of the manufacturing departments, and in the prevention of waste generally, are best appreciated by those who have had experience of them.

Continuous Inspection of Stores.

The continuous inspection of stores should form part of the essential routine of store-keeping. Report should be made upon the discrepancies discovered in the examination, so that action may be taken where the discrepancies are of a serious character. Ascertained losses should be written off, so that the Stores Control Balance may reflect as accurately as possible the actual cost value of materials on hand.

This is a fairly comprehensive description of methods of stores control. The mechanism described is suitable for large and small businesses, but modifications would,

have to be made to suit particular requirements. Problems arise in particular industries, mainly through the nature of the stores held, which it is impossible to deal with in a general way.

A difficulty arising in connection with stores control, experienced by practically all manufacturers, may conveniently be mentioned at this stage. This has to do with the control of material originally requisitioned for a particular purpose, and not utilized for that purpose. A workman who has a piece of material left over from one "job," which he knows is suitable for his next, will not always see the necessity for taking this material back to the stores, and securing a fresh requisition for the required quantity. To meet this condition some manufacturers use a transfer form, showing the particulars of any material which has been utilized for a "job" other than the "job" for which it was requisitioned in the first instance. These transfers are initialled by the foreman and handed into the stores from time to time. In this way time is saved, particularly when the stores are not as conveniently situated as they might be.

One other aspect of store-keeping calls for remark. Some manufacturers consider it inadvisable for those who actually hand out materials from the stores to have control of or access to the individual Stores Ledger Accounts. For this reason the stores records are put under independent control, often in the purchasing department, to which all requisitions are passed from the stores and the Stores Ledger written up away from the stores department. In other cases the stores control is exercised from the Cost Office. The questions raised by procedure of this kind are largely questions of administration and cannot be criticized generally.

Where, however, the stores department is large, the control is perhaps more efficiently exercised as a general rule by a chief stores clerk, acquainted with the practical difficulties which arise in store-keeping.

CHAPTER X

WAGES Records—Records of Work Done—Factory Orders—The Three Main Divisions of Wages Expenditure—Standing Orders and Their Use—Classification of Standing Orders.

Wages Records.

WE will now consider what methods should be adopted for recording wages expenditure. Two distinct records of wages are usually necessary, viz.—

(1) A record of total time worked.

(2) A record showing details of work done, so that the total wages expenditure may be correctly allocated to factory orders.

Records of workers' time are usually kept at the factory gate. The record may actually be taken by a timekeeper, or it may be a clock record. Clock records are coming more and more into favour. Although they are not altogether free from defect, as most manufacturers know, they are nevertheless superior to other forms of recording the total hours of the workers. It is not necessary, however, to discuss methods of recording total time. The record, however obtained, should be full and accurate. It should show each worker's identification number, name, trade, hours worked daily, distinguishing between ordinary time and overtime.

The use of separate serial numbers for each workshop or department is usually preferable to a single set of serial numbers for the whole of the workers without distinction. By this means, the wages records of each department may be kept self-contained, and the process of reconciling total wages paid with total allocations to factory orders is facilitated.

Where no such departmental distinctions are observed

from the outset, separate reconciliation of the wages of each department with total departmental allocations must involve unnecessary labour.

Records of Work Done.

• There are many methods of recording details of work done by each worker, and the conditions of the factory organization, the nature of the manufacturing operations, and the class of workmen employed, require to be carefully studied before any particular method is decided upon.

In some cases the use of a card which combines the record of total time worked with details of the work done may be found convenient.

In other cases the record of total time is kept quite distinct from the records of work done.

Other methods include the following, viz.—

(1) The issue of a work card to each worker for each order or "job," whether the order involves more than one day's work or only a few minutes. At the end of the wage period, all cards relating to uncompleted "jobs" are collected and replaced by continuation cards.

(2) The issue of one card each week to each worker on which details of work done during the week are entered. The time occupied on each "job" is recorded, as well as the number or symbol, identifying the order to which each allocation of wages is to be charged.

(3) One card issued to each worker each day showing details of work performed during the day.

(4) One card issued in respect of each "job" order, and the issue of a continuation card for all orders incomplete at the end of the day.

Method No. 1* enables reconciliation of total time with detailed time allocations to be made for each wage period, usually one week. Method No. 4 enables this reconciliation to be made daily. The particular feature of these

two methods is that all cards relating to the same order may be brought together, and recopying of details of operations in relation to each order, usually necessary with methods Nos. 2 and 3, is thereby avoided, except when specially required.

Another method is the recording, on a Time Analysis Sheet by a time-taker once or twice per day, of particulars of time worked on individual orders. Where each operation involves a long period of time on the average, and the number of separate "job" orders upon which workers are engaged is relatively small, this method is a convenient one.

Each of these methods is suitable in particular cases. The underlying object of them all is the collection of the necessary records for statistical and Costing purposes in as economical a way as possible. The use of separate cards for each "job" order has many advantages in particular circumstances. The sorting and totalling of these in the Cost Office is facilitated and much recopying avoided.

The verification of total time as shown by the gate records, with the total time charged to factory orders on the work cards, is the first step in the process of calculating wages. After this, it is necessary to extend the work cards by inserting the hourly wage rate and calculating the earnings chargeable to each factory order number.

In the case of piece-workers, the calculations are made by reference to the piece-work rates and the number of operations performed. With piece-workers and day-workers, therefore, it is necessary for the wages department to have, in simple form, particulars of the day-workers' hourly rate, and of the piece-workers' piece-work rates.

It is advisable that time occupied on different factory orders by piece-workers as well as day-workers should be shown on individual work cards, so that total time as shown by the gate record may be reconciled with total time charged to factory orders, thus providing, to some extent

at any rate, an independent check upon the accuracy of the work cards.

Where the man-hour or machine-hour methods of allocating oncost are adopted, a record of hours worked on each order by direct wage earners, whether at piece-work or day-work rates, is essential, apart from this consideration.

The aggregate of the earnings chargeable to factory orders should agree with the total wages due to the workers. Consequently the total wages expenditure will agree with the total of the wages allocations shown on the work cards for the same period. An illustration of a weekly Wages Analysis, very similar in form to the Summary of Stores Issued, is shown on the next page. This analysis is made from the work cards, and the total is reconciled with total wages paid. Daily or weekly agreement necessitates the recording of hours worked on the last order of the day or week, as already explained, whether that order is complete or not.

Factory Orders.

The factory orders which control the distribution of the work of the factory amongst the workers are divisible into several classes. We have already distinguished between direct and indirect producers. The first class is engaged in the main business of production. The second class is engaged in supplying and maintaining services to the direct producers, which, though essential, are nevertheless auxiliary to the main function of a manufacturing business.

It is convenient now to point out a further feature connected with certain of these auxiliary services. Certain classes of indirect wage-earners are engaged in the direct production of manufactured articles. These articles, however, are not usually made to be sold direct to consumers. In this group we may mention the production of special tools, jigs, patterns, and dies. The manufacture of these involves the allocation of material, labour, and oncost

**SUMMARY OF WAGES ANALYSIS FOR
FOUR WEEKS TO 19 . .**

Order Numbers	Description.	1st week.	2nd week.	3rd week.	4th week.	Total.
	<i>Production Orders—</i>	£	£	£	£	£
	Department No. 1 . .					
	" " 2 . .					
	" " 3 . .					
	Plant addition orders . .					
	Orders for special Repairs to Plant and Buildings . .					
	Orders for Alterations . .					
	Total					
	<i>Wages Expenditure on Standing Orders, viz.—</i>					
	Building Repairs—					
	Power House . .					
	Stores					
	No. 1 Department . .					
	" 2 " . .					
	" 3 " . .					
	Cleaning of Buildings—					
	Power House . .					
	Stores					
	Supervision Offices . .					
	No. 1 Department . .					
	" 2 " . .					
	" 3 " . .					
	Repairs to Power Plant . .					
	Cleaning of ditto . .					
	Wages of Boilermen . .					
	Repairs to Office Furni- ture, etc.—					
	Supervision Offices . .					
	Stores Equipment . .					
	Stores Wages					
	Repairs to Producing Plant—					
	No. 1 Department . .					
	" 2 " . .					
	" 3 " . .					
	Cleaning Producing Plant—					
	No. 1 Department . .					
	" 2 " . .					
	" 3 " . .					
	Sundry Standing Orders etc., etc.					
	Total					
	<i>Selling and Distribution Wages, viz.—</i>					
	Storekeepers in Finished Stores					
	Packing Case Makers . .					
	Packers					
	Motor Drivers					
	Vanmen, etc., etc. . .					
	Total					

The Standing Order Numbers or Symbols are inserted here.

expense in exactly the same way as in the case of articles made for sale.

In the manufacture of a die, for instance, steel is requisitioned from the stores, the wages of die sinkers have to be allocated to particular dies, and some provision made for the cost of supervision, the use of machinery, consumption of power, and other expense essential to die production.

In some cases, indeed, such products as we have mentioned are actually sold, and although they may remain in the possession of the manufacturer for production purposes, the property in them definitely passes to the purchaser.

Generally speaking, however, much of the expense of producing such articles is not directly recovered, but forms part of the indirect expense of manufacture, which has in some way to be distributed to the cost of articles made for sale.

Divisions of Wages Expenditure.

Wages expenditure, therefore, falls into three main divisions—

(1) Wages expended on the direct production of articles made for sale.

(2) Wages expended on direct production of articles not made for sale, but which form part of the indirect expense of manufacture.

(3) Wages expended on the maintenance and supply of auxiliary services, not involving the production of manufactured articles.

The Costing mechanism should therefore provide for the ascertainment of the costs of articles in divisions 1 and 2, and for the collection of the expense of the various services falling into division 3.

Orders to the factory for the manufacture of articles falling into groups 1 and 2 are made under definite order numbers. These order numbers are used to identify the expenditure of material and labour on each of the orders.

The same procedure is adopted for the purpose of collecting together wages and material expenditure on auxiliary services falling into group No. 3. There is, however, this important distinction. Whereas the separate cost may be required of dies, or special tools, or jigs, falling into group No. 2, orders falling into group No. 3 are usually orders in respect of which the separate ascertainment of cost is not desired.

For instance, the separate cost of effecting an incidental repair to machinery would not, as a general rule, provide useful information to the management, nor would the separate cost of cleaning the shop floor on any particular day.

What the management is more concerned with is the periodical expenditure under these heads, and in other classes of similar character.

It is necessary, therefore, first of all to decide what analysis of the expenditure on these auxiliary services will give the most useful information.

Standing Orders and Their Use.

The analysis having been determined, a number or symbol is allocated to each classification, which may hold good for all time. These numbers are usually called Standing Order Numbers. They are so described because they indicate orders, the need for which occurs so frequently or regularly that their formal repetition would be irksome and useless.

The object of allocating to each expense classification a fixed number or symbol is to facilitate the collection of all expenditure in this class, and the charging of this expenditure to its proper account from time to time. In this way the expenditure on auxiliary services is brought into the oncost expense at regular intervals.

The classification should be carefully made so that the details of expenditure collected may be easily subjected to scrutiny, and compared with expenditure for previous periods.

For instance, repairs and maintenance, the expenditure on which is so commonly grouped under this single division, might conveniently form the subject of several subordinate classifications, distinguishing between repairs of different kinds. There are, for example, repairs to machinery, repairs to buildings, repairs to power plant, repairs to tools. If, therefore, the expenditure on repairs and maintenance is sub-divided into these classifications, the monthly expenditure under each sub-division would be much more enlightening for comparative purposes than the total expenditure on repairs and maintenance without reference to their nature.

Classification of Standing Orders.

Much importance attaches to the organization of a standing order system. In determining the accounting classifications for the whole of the indirect expenditure, we should first of all make broad classifications which divide the indirect expenditure into natural groups of essential services.

Each group is then divisible into several subsidiary classifications. For instance, building expense might be divided into the following classes—

- (1) Rent, Rates, and Insurance.
- (2) Lighting.
- (3) Heating.
- (4) Cleaning and sundries.
- (5) Repairs.

The power expense might be divided into similar classes, such as—

- (1) Rent, Rates, and Insurance.
- (2) Depreciation.
- (3) Repairs to Plant.
- (4) Fuel.
- (5) Wages.
- (6) Sundries.

In determining the number of classifications in each

main group, we should have in mind the nature of the service and the usefulness for administrative purposes of the records of periodical expenditure under each classification.

The next object should be to arrange standing order numbers, so as to secure the departmentalization of the indirect expenditure. If the business consists of five or six different departments, the numbers or symbols should be arranged to facilitate the dissection of expense of the same nature incurred in each department, and at the same time the ascertainment of the total expense under each classification for the whole of the business. This enables ready comparison of the expense of each department to be made. That is to say, by adding together the departmental expenditure, we thereby ascertain the total expenditure under each classification for the whole business. In this way we establish a means of control over indirect expenditure of an extremely valuable kind.

Standing orders facilitate the allocation of all expense to departments, and reduce to a minimum the expense which cannot be directly allocated. Correct departmentalization of expense is the essence of accurate Costing. The apportionment of expense to departments on more or less arbitrary lines, such as the apportionment of tools expenditure according to the amount of direct labour expended in each department, should be avoided as far as possible.

Two schedules of standing orders are set out on pages 149 and 150. These schedules are not complete. They do not cover the whole of the expense of production, but are sufficiently comprehensive, perhaps, to make clear the various objects underlying a Standing Order System.

Dealing with the first schedule, we observe that the symbols or numbers are arranged so that the figure in the units column will bear the same significance in each group of expense. Under Building Expense, for instance,

STANDING ORDER SCHEDULE.

Sym- bols or Nos.		Departments :				
		1.	2.	3.	4.	5.
	BUILDING EXPENSE—					
00	Repairs and Main- tenance	100	200	300	400	500
01	Depreciation of Equip- ment	101	201	301	401	501
02	Rent, Rates, and In- surance	102	202	302	402	502
03	Lighting & Heating .	103	203	303	403	503
04	Cleaning & Sundries.	104	204	304	404	504
	POWER EXPENSE—					
10	Repairs to Equip- ment	110	—	—	410	510
11	Depreciation	111	—	—	411	511
14	Cleaning & Sundries.	114	—	—	—	—
15	Wages	115	—	—	—	—
16	Salaries	116	—	—	—	—
17	Fuel	117	—	—	—	—
18	Water	118	—	—	—	—
	MANAGEMENT AND SUPERVISION—					
20	Repairs to Furniture and Fittings	—	—	320	—	—
21	Depreciation of Furni- ture & Fittings . . .	—	—	321	—	—
25	Wages	—	—	325	425	525
26	Salaries	—	—	326	—	—
	STORES—					
30	Repairs to Furniture and Fittings	—	230	—	—	—
31	Depreciation	—	231	—	—	—
35	Wages of Storekeepers Labourers, etc. . . .	—	235	—	—	—
36	Salaries of Stores Clerks	—	236	—	—	—
	PRODUCING PLANT—					
40	Repairs	—	—	—	440	540
41	Depreciation	—	—	—	441	541
44	Cleaning & Sundries.	—	—	—	444	544

STANDING ORDER SCHEDULE.

Symbols or Numbers.		1.	2.	3.	4.	5.
BRM	BUILDING EXPENSE—	BRM/1	BRM/2	BRM/3	BRM/4	BRM/5
BD	Repairs and Maintenance	BD /1	BD /2	BD /3	BD /4	BD /5
BRT	Depreciation of Equipment	BRT /1	BRT /2	BRT /3	BRT /4	BRT /5
BLH	Rent, Rates, and Insurance	BLH /1	BLH /2	BLH /3	BLH /4	BLH /5
BCS	Lighting and Heating	BCS /1	BCS /2	BCS /3	BCS /4	BCS /5
	Cleaning and Sundries					
PR	POWER EXPENSE—	PR /1			PR /4	PR /5
PD	Repairs to Equipment	PD /1			PD /4	PD /5
PDS	Depreciation	PDS /1				
FWS	Cleaning and Sundries	PWS /1				
PS	Wages	PS /1				
PF	Salaries	PF /1				
PWR	Fuel	PWR /1				
	Water					
	MANAGEMENT AND SUPERVISION—					
MR	Repairs to Furniture and Fittings			MR /3		
MD	Depreciation of Furniture and Fittings			MD /3		
MWS	Wages			MWS/3	MWS/4	MWS/5
MS	Salaries			MS /3		
	STORES—					
SR	Repairs to Furniture and Fittings		³ SR /2			
SD	Depreciation		SD /2			
SWS	Wages of Storekeepers, Labourers, etc.		SWS /2			
SS	Salaries of Stores Clerks		SS /2			
	PRODUCING PLANT—					
PLR	Repairs				PLR /4	PLR /5
PLD	Depreciation				PLD /4	PLD /5
PLC	Cleaning and Sundries				PLC /4	PLC /5

the first symbol 00 is related to repairs. It will be seen also that 10 signifies repairs to power house equipment ; 20, repairs to furniture and fittings in the management and supervision offices ; 30, repairs to fixtures and fittings in the stores ; and 40, repairs to plant in the producing departments.

The unit figure 1, signifies depreciation charges in each group, and the unit figure 2 signifies charges for rent, rates, and insurance. Other unit figures signify other classifications of a like character in each group.

The figures 1 to 5 appearing at the head of the five columns on the right hand side of the schedule represent five departmental divisions. No. 1 represents the Power House ; No. 2, the Stores Department ; No. 3, the Management and Supervision Department. The first three divisions therefore represent what are usually termed service departments. Nos. 4 and 5 represent the direct production departments.

These divisions are only typical. They may be contracted or extended according to the circumstances of each particular case.

The addition, therefore, of the departmental number as a prefix to the symbol number identifies the department for which expense, collected under any of these numbers, is incurred. Take for instance the first item, Repairs to Building. Under Standing Order No. 100, labour and material expended on repairs to the building in department No. 1 are all identified and collected. Likewise repairs to buildings in department No. 2 are ascertained by means of Standing Order No. 200, and so on.

It will be evident that wages expended inside the factory, and materials used from stores, will only fall under some of the headings in the Standing Order Schedule. The item Depreciation, for instance, cannot include wages or material. The same applies to rent, rates, and insurance.

Standing order numbers are nevertheless usefully

attached to every class of expense included in the accounting analysis. They may be used for interdepartmental reference, and also to indicate the classification to which expenditure from outside sources should be charged. Suppose, for instance, repairs to buildings were executed by an outside contractor, the use of the standing order number upon the invoice, say No. 500, would indicate that the repairs were to be charged to department No. 5.

The Schedule of Standing Orders on page 150 is not based upon numbers, but mnemonic symbols. The symbol BRM, for example, signifies Building Repairs and Maintenance. PF signifies Power Fuel. To secure proper allocation to different departments, the departmental number is added to the symbol. This method is preferred by many.

In some cases wages allocations may be effected without subdivision of the weekly wages of particular wage earners, for the reason that they may perform certain duties which fall completely within a distinct accounting classification. Generally, however, this will not be the case. A wage-earner, such as an engineer or millwright, may be occupied on repairs to plant and machinery and also possibly on additions to plant and machinery. His work will also be related to different departments of the business. His time, therefore, should be allocated to distinguish first of all between work performed for different departments; then to distinguish between different kinds of repairs in accordance with the classification which it is desired to make. Work also on plant additions must be distinguished from current repair work. The same observations will apply to tool makers, the production and maintenance of general tools requiring to be charged to each department according to the expenditure incurred for each.

It is only by the use of time cards, facilitating the correct allocation of indirect wages expenditure to proper groups, that this floating expense, which in many businesses forms

a very large proportion of the total expense of production, is brought under control. Much wasteful expenditure may be brought to light in this way and, if this expenditure is properly classified, the relation of direct to indirect wages expenditure from time to time forms a reliable and useful index of factory efficiency.

CHAPTER XI

Four Control Accounts—Stores Account, Wages Account, Factory Overhead Account, Work in Progress Account—Identifying Cost with Products—Various Methods—Main Production Orders—Component Orders—Issue of Factory Orders—Costing by Processes—Summarizing Costing Results.

Four Control Accounts.

WE have, so far, reviewed the necessary routine to facilitate on the one hand the allocation of direct material and labour to work in progress, and on the other hand the allocation of indirect expense to its proper accounting group.

It will perhaps be convenient now to describe in simple form the main accounts which record and control these allocations. On page 155, four main accounts are set out—

- (1) Stores Account.
- (2) Wages Account.
- (3) Factory Overhead Account.
- (4) Work in Progress Account.

Stores Account.

The Stores Account is charged with purchases for stores as shown by the Purchase Journal.

For purposes of illustration let us suppose that the figures relate to the first three months trading of a new business, and that the purchases for stores during that three months amounted to £2,400. The first three credits to this account represent the monthly value of the material issued from stores for production orders.

These credits are ascertained by means of the Material Requisition Notes and the Stores Issued Journal, before described. As this material is withdrawn for direct manufacturing purposes it immediately forms part of the

Dr.	STORES ACCOUNT.	Cr.	
	£	£	
To Purchases as per Purchase Journal	2,400	By Work in Progress A/c	400
		" " " "	700
		" " " "	800
		" Factory Overhead A/c	50
		" " " "	30
		" " " "	70
		" Balance c/d	350
	<u>£2,400</u>		<u>£2,400</u>
To Balance b/d	350		

Dr.	WAGES ACCOUNT.		Cr.
To Cash : Wages paid	£ 5,000	By Work in Progress A/c .	800
		" " " " .	1,000
		" " " " .	2,000
		" Factory Overhead A/c .	250
		" " " " .	450
		" " " " .	500
	<hr/> £5,000		<hr/> £5,000

Dr.	FACTORY OVERHEAD ACCOUNT.	Cr.	
	£	£	
To Building Expense	250	By Work in Progress A/c	600
" Power Expense	350	" " " "	700
" Plant Maintenance	450	" " " "	855
" Stores Expense	75	" Balance c/d "	20
" Management & Super- vision	500		
" Miscellaneous Supplies	250		
" Tools and Patterns	300		
	<u>£2,175</u>		<u>£2,175</u>
To Balance b/d	20		

Dr.	WORK IN PROGRESS ACCOUNT.		Cr.
	£		£
To Materials from Stores	400	By Finished Goods A/c	1,800
" " " "	700	" " " "	2,000
" " " "	800	" " " "	3,255
" Wages A/c"	800	" Balance c/d	1,000
" " " "	1,000		
" " " "	2,000		
" Factory Overhead A/c	600		
" " " "	700		
" " " "	855		
	<u>£7,855</u>		<u>£7,855</u>
To Balance b/d	1,000		

cost value of work in progress. The corresponding debits to these credits on Stores Account will accordingly be found on the Work in Progress Account.

The three other credits to Stores Account represent stores issues chargeable to indirect factory expense and include items such as oil, rags, and cotton waste. The corresponding debits of these amounts are first of all allocated under the appropriate standing order numbers to the proper classes of expense, and finally find their way to the Factory Overhead Account. The balance of the Stores Account represents the cost value of stores on hand.

Wages Account.

The Wages Account is debited with the total wages paid for the three months. In practice this debit would be made at shorter intervals. The first three credits to this account represent, in monthly totals, the amount of wages directly allocated to production orders, and their corresponding debits will be found on the Work in Progress Account.

The remaining credits to Wages Account represent allocations to various classes of indirect factory expense under the appropriate standing order numbers, and they also find their way to the debit of the Factory Overhead Account.

Factory Overhead Account.

The monthly debits to Factory Overhead Account are collected from Standing Order Cost Schedules, a procedure which we shall describe later on.

The three credits to Factory Overhead Account represent the monthly totals of oncost allocations to separate "jobs" or orders. These totals are derived from the cost sheets relating to these "jobs" or orders. The balance of this account therefore represents the amount of factory overhead expense remaining undistributed to costs. If the

balance were on the credit side, it would record the extent to which overhead expense had been distributed to individual costs in excess of the actual ascertained overhead expense for the period.

Work in Progress Account.

The Work in Progress Account is sometimes called Manufacturing Account, and it is from this account that the periodical statement as shown elsewhere is prepared. The debit side of this account receives charges for materials from stores, issued on direct production order requisitions ; debits from Wages Account representing direct labour allocations ; and also amounts representing the monthly totals of oncost allocations to production orders.

A monthly transfer of completed orders, the costs of which have been ascertained, is made from the credit of Work in Progress Account to the debit of Finished Goods Account. The balance therefore represents the value, in labour, material, and oncost expense, of the work in progress in the factory.

All these accounts may be regarded as Control Accounts. The Stores Account balance is capable of verification by reference to the detailed Stores Accounts. The Wages Account summarizes the whole of the wages allocations made for the period, these allocations having been agreed with the actual wages paid in the way already described.

The Factory Overhead Account summarizes the whole of the indirect expense of the factory, and shows to what extent the actual expense falls short of or exceeds the oncost allocations to individual costs. It does not verify the equity of the method of allocating oncost. It does not show that each product has borne its proper share, and its proper share only, of oncost expense. It does show, however, that we have recovered, equitably or inequitably, the whole of the oncost expense incurred. Whether this recovery is equitable or not depends upon

the standard we adopt for the measurement of oncost expense in relation to individual orders or "jobs."

Finally, the Work in Progress Account is a Control Account of the whole of the manufacturing operations, the balance of which may be verified by reference to cost records—of uncompleted work.

This is a brief explanation of the accounts which control the totals of costs, divided into the three principal elements—material, labour, and oncost.

Identifying Cost with Products.

We have now to consider what arrangements are necessary in order to bring together the expenditure under each of these heads in relation to distinct articles or groups of articles, or, it may be, to separate contracts.

There are several ways of identifying cost with factory product, and the methods to be adopted in particular cases will vary according to circumstances. It is quite likely that different methods may be applied to separate departments of the same business. In the case of a business which generates its own power, for instance, the unit adopted for ascertaining the power cost would depend upon the nature of the power generated. If the power were gas, or electricity, or steam, the unit would be cubic foot of gas, some electric unit for electric power, according to circumstances, and horse-power unit in the case of steam.

Having segregated the total power expense from the other expense of the business, it should be divided at regular periods by the quantity of units generated. The cost per unit is thus ascertained, and the power expense is then charged to the various departments of the business according to the number of units consumed. The number is ascertained either by actual measurement, or by the estimate of someone competent to apportion the units to the departments.

It is then possible to decide whether the generation of power is economical, or whether it would be more advantageous, having regard to all the circumstances, to rent power from an outside source.

There are some industries which of themselves provide a convenient natural unit for Costing purposes. In the coal-mining industry, for instance, the ton raised to the surface forms the natural unit of output, and the division of the whole of the expense of coal-getting and coal-raising into the quantity of coal raised gives a price per ton.

In a brewery the unit of cost may be the barrel.

The adoption of similar units of output is sometimes practicable in departments of ordinary manufacturing businesses. It may be that a department is exclusively engaged in the manufacture of a single article, going through the same processes, so that the total expense of the department, divided by the quantity of articles produced, will give the average cost per article.

This method may also be extended to cases where more than one article is being produced, providing each article undergoes the same manufacturing processes, the differences being perhaps merely differences in the material used, or in the size and shape of the articles.

If, however, these differences cause variations of the time involved in the manufacturing processes, it will be necessary to take records of time in relation to each kind of article.

The total expense of the department must then be divided proportionately with the time taken in the manufacture of each kind of article. In this way we ascertain the manufacturing cost in relation to each kind, and by dividing each of these costs by the quantity of each article produced we ascertain the manufacturing cost per article. The addition of the material cost to the manufacturing cost will give the total cost of production.

Two points are of importance in connection with this method—

(1) Each kind of article must go through the same number and kind of manufacturing processes.

(2) The wages rate in relation to each kind of process on each kind of article must be substantially the same.

Where large numbers of different articles in different quantities, and involving different processes, are manufactured by the same organization, it is obvious that some other unit than the total quantity of articles produced for any period is essential.

If, the output, for instance, consisted of fire-grates of 100 different types, it would be useless to ascertain the average cost per fire-grate. It would be essential to ascertain the expenditure on each class of fire-grates.

This, however, would only give us the total cost of producing each class. Greater detail would be necessary to make the costs useful for other purposes than the ascertainment of total cost.

Main Production Orders.

In order, then, to ascertain the cost of such articles, it is necessary to devise methods of distributing to each type the expenditure in material, wages, and oncost incidental to its production. The method is governed by the nature of the orders issued to the factory. Orders to the factory in such a case will usually be for a definite quantity of each type. The quantity itself has no significance from a Costing standpoint, but is usually governed either by the quantity ordered by a customer, or by the quantity which it is considered desirable to make for stock. To such an order a definite number is attached and all instructions in respect of it will bear this number. Requisitions of materials from stores will bear this number, so that the identity of material issued in relation to it may be preserved. All wages cards, recording time spent and wages

paid for manufacturing processes involved in the execution of this order, will bear the same number, so that on completion the total wages expenditure may be duly ascertained.

In issuing orders to the factory, the question of the degree of detail which it is desired to arrange for in the final cost should be carefully considered. The ascertainment of the total cost only of 1,000 fire-grates, involving probably a very large number of distinct operations, will not be very illuminating from a manufacturing point of view.

If, for instance, it was found that the cost of producing 1,000 of these fire-grates in the month of January considerably exceeded, or fell short of, the cost of producing 1,000 in December, information which only consisted of the total material labour and oncost expended on each lot would not of itself indicate very clearly the reasons for this rise or fall in costs.

This would be particularly so if there were many reasons. If the variation of cost were due to the price of raw material only, this knowledge might conceivably be sufficient to enable complete reconciliation of the costs of the two lots to be made.

If, however, the variation were due to—

- (1) Variations in the price of raw materials ;
- (2) Variations in wage-rates, either as a whole or in relation to particular manufacturing processes ;
- (3). Alteration in manufacturing methods ; the effect of all these variations upon the costs of the two lots of grates would require much clerical labour to ascertain.

The issue of orders, therefore to the factory should have regard to the nature of the information which it is desired to collect in the final costs.

Component Orders.

The degree of detail which it is advisable to record will depend largely upon the nature of the articles

manufactured. If, for instance, an article consists of numbers of component parts which are manufactured separately, and are finally assembled together, it may be sufficient to record the separate cost of each component part. In that case, in addition to the use of an order number for the quantity of complete articles which it is desired to manufacture, the use of subsidiary numbers usually termed component numbers is essential. These component numbers will enable the labour expenditure on each separate component to be collected together, as well as the separate expenditure of direct material on each component part, where this is necessary. The final cost, therefore, will consist of—

- (1) A separate cost of each component part.
- (2) A total cost of all these component parts, plus the cost of assembling.

A cost in this form is more useful for comparative purposes than a total cost which does not distinguish between separate components.

Issue of Factory Orders.

The issue of orders to the factory will vary in form according to the nature of the industry, and of the manufactured article.

In some industries, these orders require a great deal of thought in planning. They will necessitate the compilation of a record showing—

- (1) The main order number.
- (2) The quantity and nature of the article.
- (3) The names of the component parts, and the processes which each component has to undergo.
- (4) A subsidiary number for each component.

It is usual to assign two separate series of numbers to production orders. The first series identifies the main order, and the second series will identify the subsidiary component orders. It is advisable to keep a record of these

numbers, showing clearly what component order numbers have been set against the main production order.

In some industries, where the processes in relation to each article are standard in character, the use of subsidiary order numbers is not necessary, the single production order being sufficient to identify all the expenditure, and the nature and order of the manufacturing processes being sufficient to identify the expenditure on each process.

Another division, however, must be borne in mind which is of the utmost importance. Where an article, or a component part of an article, passes through several manufacturing departments, it will be necessary to identify the work performed in each of these departments.

This is important because of the need for allocating oncost rates to the separate work of each department. These rates may vary greatly. The identification of the work performed in different departments may be effected by making use of different coloured material requisition notes and wage tickets for each department.

The departmentalization of material requisitions is, however, not always necessary. Where the nature of the product itself determines the identity of the material requisitions, all material in such a case may be charged to the main order number. Where, however, fresh material is required as the work progresses through the departments which is not easily identified with the manufactured article, then, departmentalization is necessary, and the material should be charged under the component order number of the part to which it relates.

Costing by Processes.

A variation of this method of collecting cost under order numbers identifying particular lots of goods requires to be considered. In some businesses the manufacture of certain articles, or component parts common to a number of manufactured articles, which differ in other respects,

is proceeding almost continuously. This is particularly so where the classes of articles manufactured are not very large. Gas and electric meters may be instanced as typical of such classes.

In such circumstances it will readily be seen—

(1) That the ascertainment of the cost of distinct processes may be of equal administrative importance with the ascertainment of the cost of a distinct type of article.

(2) That the adoption of the method identifying particular quantities of articles by the means we have described has certain disadvantages.

Under the method just described the identity of component parts relating to a particular production order for a definite quantity of completed articles is never lost. Where, however, the production is continuous, and where it is the practice to manufacture component parts which bear no definite relation to a single type of product, but which may form part of several different types, the preservation of the identity of separate lots under distinctive order numbers proves to be rather irksome in practice.

There are apparently two methods of overcoming this difficulty. The first method is to issue main orders for the production of such parts. Upon completion, these parts go into the finished stores and await requisition in the ordinary way when required for assembly into completed articles of definite type. But this method is found to be impracticable in particular cases.

The alternative method entails the ascertainment of costs, not by lots, but by processes, and the average cost of each process is ascertained by the periodical collection of the number of separate processes performed and the wages paid in respect of each.

If we take the case of an article, or part of an article, passing through ten processes, it will be apparent that at any given moment there will be a number of these articles in various stages of completion. We assume, of

course, that the manufacture of this article goes on almost continuously. As it is impracticable, therefore, to identify separate and complete lots with wages paid for their manufacture, Costing must be by processes. By ascertaining the average periodical cost of processes, we may build up from these details an average periodical cost of completed articles. •

We may also obtain, at the same time, information as to the quantities which remain in the factory in various stages of manufacture.

We find out incidentally, for instance, that 100 of these articles have gone through the first manufacturing process only, 150 have passed through the second process, and so on. The advantage of this method is that it facilitates the control of the cost of each process and the regular comparison of one period of production with another.

Summarizing Costing Results.

Whatever method of Costing is adopted, the fixing of the period in respect of which Costing results are summarized is of some importance. If we look again at the Wages Account on page 155 we see that the credits for the three months exactly equal the debits. If the wages are paid weekly, as they usually are, then the total wages paid during the three months are either the wages paid for thirteen complete weeks, or they represent the actual wages accruing for payment for three calendar months. This, of course, will involve the calculation of wages accrued daily, and in practice, unless the three months happen to begin and end on the commencing and ending day of the wage period, a balance of wages accrued, but not due, will appear in the Wages Account, if the two sides are to balance.

The other inference drawn from the account is that the debit represents thirteen weeks actual payments of wages and that the credits represent wages allocations for two periods of four weeks each, and one period of five weeks.

Where such method is adopted, twelve months trading would consist of eight periods of four weeks, and four periods of five weeks. This is the method which some manufacturers adopt, the object being to facilitate the verification of total wages paid with the total wages allocated to orders. Others adopt thirteen periods of four weeks each and this appears to be preferable where total wages accruing daily are not agreed with total wages allocated daily.

In any case, calendar months do not include the same number of working days, and therefore, as a basis of comparison they are not so satisfactory as four-weekly periods.

On the other hand, many items of expense, such as rent, rates, power (when derived from an outside source), salaries of the management and staff, are payable monthly or quarterly, and it is a matter of some inconvenience to convert all these charges into weekly rates.

If the daily ascertainment of wages payable affords no difficulty and is part of the Costing routine, it will generally be found more convenient to adhere to the monthly period.

It may be thought that such Costing methods as we have described involve a large amount of clerical labour. It is, however, clerical labour of a special kind having definite objects, and extremely useful objects, in view, and the use of office machinery facilitates the performance of Cost Office routine with extraordinary dispatch. The extraction of stores ledger balances and the addition of wages allocation cards and material requisitions, as well as the calculation of overhead expense in relation to separate orders, is all work which may be rapidly performed by inexpensive clerical labour, given adequate and efficient supervision, and the requisite office machinery.

CHAPTER XII

FINAL COSTS—Reconciliation of Final Costs with Actual Expenditure—Clearing of Departmental Work in Progress Accounts—Finished Goods Account—Plant Additions—The Collection and Distribution of Oncost Expense—The Oncost Journal—Methods of Apportioning Expense not Directly Identified with Separate Departments—Calculation of Machine-hour Rates.

Final Costs.

VARIOUS ways of identifying cost with factory product, have now been reviewed. We see that the four accounts—Stores Account, Wages Account, Factory Overhead Account, and Work in Progress Account—are really Control Accounts summarizing the producing activity of the factory.

The Stores Account is an index of the value of stores received and issued, the balance of the account representing the cost value of materials in store.

The Wages Account shows the total allocation of wages to factory orders, whether these orders are production orders or standing orders. Any balance appearing on this account would represent wages earned and allocated to orders, but not yet paid.

The Factory Overhead Account is an account into which all the indirect expense of the factory is collected, and summarized under headings descriptive of the various functions or services rendered to the main business of production. This account will be credited periodically with the total oncost distributed to the factory products.

Where the business is subject to seasonal fluctuations, making desirable the allocation of a normal oncost to factory products, as distinct from the actual oncost for the period, the balance of this account from time to time will show the extent to which the overhead expense distributed to costs during the period has varied from the normal.

In slack seasons, for example, the balance will be a debit balance, representing what is known as "unearned burden," or overhead expense not taken up by allocation. In busy seasons, when output exceeds the normal, this debit balance would be reduced. At the end of the financial period, the balance of this account will either represent overhead expense allocated in excess of the actual, or overhead expense remaining unallocated on account of the actual output falling short of the estimated output during the period.

We see also that the Work in Progress Account is debited with the total allocations of materials, wages, and indirect expense, and credited with the total cost of completed orders. The balance of this account, therefore, represents the total cost value of the uncompleted work in the factory.

We now see how the allocation of direct wages and material to separate factory orders is effected. In order to ascertain the total cost of each order, these allocations have to be collected together and summarized in convenient form on a final cost sheet. Methods of preparing these costs vary according to the nature of the manufacturing processes, the methods of identifying cost with definite quantities of manufactured articles, and also according to the nature of the information which it is desired the final cost should exhibit.

In the case of a production order which has been divided into a number of sub-orders or component orders, the separate cost of each component might be prepared from the Wages and Material Allocation Cards, showing possibly the separate cost of each manufacturing process. The final cost would be a summary of these component costs, to which the assembling cost, and the selling and distribution cost, is added.

Where there is continuous production of the same type of manufactured article it is usual to prepare a periodical

cost of articles completed during that period from the average costs of all the processes of manufacture. The average costs of processes are ascertained by collecting together the quantities involved in each operation and dividing the quantity into the wages cost.

Reconciliation of Final Costs with Actual Expenditure.

It is impossible to describe exactly the numerous forms which final cost schedules may take. It will perhaps be sufficient to say that the details of a final cost should be arranged to facilitate the separate identification of the wages, material, and oncost charges of each Costing period.

Departmental divisions should also be clearly shown, so that the oncost charges applicable to the work done in each department may be correctly calculated.

Where the production-hour method of allocating oncost is adopted, the number of production-hours worked on the order should be shown in periodical totals, and where the production-hour is the machine hour, the number of the machine must be stated against the separate totals of hours worked upon each machine or class of machines.

These schedules, having received the postings of wages and material allocations, should then be listed in convenient form in order to ascertain—

(1) Total wages allocations, and, where necessary, the number of production hours for the period.

(2) Total material allocations for the period.

Where several manufacturing departments are concerned, separate listing of these details for each department will be necessary. The lists should show—

(1) Order numbers.

(2) Subsidiary component numbers.

(3) Number of production hours.

Then follow columns into which Wages, Oncost, and Material are entered. These columns form the source from which the three accounts, viz.—

- (1) Wages Account,
- (2) Factory Overhead Account,
- (3) Stores Account,

are credited periodically.

Further columns appear in the lists for the separation of the orders between Production Orders to be debited to Work in Progress Account, and Plant Addition or Repair orders to be debited to the Plant Addition or Plant Repairs Account. The total of these columns should agree with the total of the three previous columns headed Wages, Oncost and Material.

The totals of these columns are agreed with the total expenditure ascertained from independent sources. That is to say, the total wages allocations should agree with the total direct wages for the same period as shown in the Summary of Wages Analysis. (See page 144.) The total material allocations should agree with the total of stores issued to production orders for the same period as shown by the Stores Issued Summary. (See page 135.)

With regard to the oncost column of the Journal, this may or may not be reconcilable with other records. If the nature of the industry is such that a regular output is maintained, it is frequently the practice to distribute to orders each month the actual oncost expense for that month.

Where the direct labour method of allocating oncost is adopted, all that is necessary is the ascertainment of the percentage which the monthly oncost bears to the total direct wages paid in each department, and to apply this percentage to the direct wages allocated to each order, as shown on the list. The resultant oncost is then extended into the oncost column, and the total of this column reconciled with the total oncost expense for the same period.

If the man-hour method of allocating oncost is adopted, the total number of production hours is ascertained by totalling the hours shown against each order number. The total hours are then divided into the total oncost expense for the month. The hourly rate then ascertained is multiplied by the number of hours charged against each order number, and the resultant amount extended into the oncost column. The total of the oncost column is then capable of reconciliation with the oncost expense for the same period.

In both cases above mentioned, the oncost charge in relation to each order is posted from the lists to the separate cost sheets.

Where the machine-hour method is adopted for the purpose of allocating oncost, the oncost column will be entered up from the separate cost sheets of each order. On these cost sheets the number of the machine and the number of hours which each machine has worked appear, and the necessary calculations of the machine-hour rates are therefore first made on the cost sheets and totalled periodically. The totals are then listed in the oncost column without further calculation.

Where by reason of seasonal fluctuations of output, it is the practice to use normal or standard oncost rates which are not based upon the experience of each period, no reconciliation of the oncost columns with the actual oncost expense will be possible. The total oncost distributed to separate orders, however, will be credited to Factory Overhead Account, and the balance of this account from time to time will be interpreted in the way already described.

Cleaving of Departmental Work in Progress Accounts.

Where there are several manufacturing departments there are also several departmental Work in

Progress Accounts. The method of clearing these accounts of the cost of finished work requires some consideration.

A production order may pass through several departments before it is complete. Suppose that in connection with a production order all the work to be performed by No. 1 department is finished. The departmental Work in Progress Account needs to be credited with the cost of this completed work, so that the balance of the Work in Progress Account may correctly represent the value of the work in progress in that department.

If we credit the departmental Work in Progress Account, what account should be correspondingly debited with the value of the work which leaves department No. 1? We cannot debit it to Finished Goods Account for, although the goods are finished as far as No. 1 department is concerned, they have possibly yet to pass through several other departments before they can be classed as finished goods.

There are three different methods of dealing with this difficulty. The first is to defer clearing departmental accounts until an order is completed by all departments. Finished Goods Account may then be debited and the departmental Work in Progress Accounts correspondingly credited.

This method, however, is only suitable in cases where the progress of work through all departments to completion is rapid. Where this is not the case the treatment of all work as work in progress, until it has passed through all the departments concerned, destroys the usefulness of the balances on the departmental Work in Progress Accounts as indicating the amount of uncompleted work in each department.

For instance, if work, complete as far as No. 1 department is concerned, still remains charged to that department as work in progress, merely because Nos. 2, 3, and 4

- departments have still to complete work on the same order, the balance of the account of No. 1 department is no longer a measure of the value of its uncompleted work.

The second method is to credit the departmental Work in Progress Accounts as work passes out of the departments, and debit the department receiving the work. This method, however, should only be resorted to when departmental productions represent both saleable articles and also articles which are transferred to other departments.

A foundry, for instance, very commonly produces castings for sale in the open market and also for machining departments of the same business. In a case of this kind, therefore, it is right that a casting supplied to a machine shop should be debited to the Work in Progress Account of the machine shop. Should this casting, however, be transferred from the first machine shop to a second machine shop, in order to undergo further machining operations, there appears to be very little reason for charging the second machine shop with the cost value of the casting, plus the cost value of the work performed upon it in machine shop No. 1.

If this were done, the Work in Progress Account of machine shop No. 2 would show a balance not only representing the labour and material expended on uncompleted work in that department, but also the value of work transferred from department No. 1. Likewise, in succeeding departments, the balances on the respective Work in Progress Accounts would represent accumulated values of work within each department.

These accumulated values have very limited uses from an administrative standpoint, and it is difficult to deduce from them clear information as to the comparative value of work done in each department. This method also entails duplication of cost records which it is better to avoid.

The third method is the crediting of each departmental Work in Progress Account with work which passes out of each department, and correspondingly debiting one account only, called Departmental Finished Work Account. These transfers are effected by listing the total cost value of finished work to be credited to the Work in Progress Account of each department. We obtain in this way a periodical total of departmental finished work, and a dissection of this total showing the amount to be credited to each departmental account.

The final stage is the transfer from the Departmental Finished Work Account to the Finished Goods Account of orders which are completed by all departments. The operation effecting this transfer is similar to that described already. A list of finished costs is prepared, totalling the cost sheets of finished production orders. From this list the Departmental Finished Work Account receives its credit, and the Finished Goods Account its debit.

Finished Goods Account.

The Finished Goods Account, therefore, is charged with the total factory cost of all completed work. Stores Records are kept for Finished Goods, identical in method with the Stores Records already described, which are debited and credited with the cost values of receipts and issues. The Finished Goods Account is therefore the Control Account of these detailed Finished Stores Records. "It forms, as it were, the account of raw material which remains to be worked upon by the selling department, whose main concern should be to relieve the Finished Warehouse of the care of these goods as early as possible. As far as the merchanting or commercial side of the business is concerned, the Finished Goods Account is the purchase account against which are placed the total sales. It is frequently found convenient to classify the finished goods into different groups, so that selling charges may be

- allocated to each group on a more equitable basis than would be possible without such classification.

Plant Additions.

Orders completed which are Plant Addition orders are not passed through the Work in Progress Account or debited to Finished Goods Account. It will be remembered that, in the listing process, Plant Addition Orders were separated from Production Orders and the expenditure on Plant Additions debited to a Plant Addition Account. On completion, therefore, of a Plant Addition order, it is usual to remove the cost sheet from the file and place it with cost sheets of the same class from time to time. These Plant Addition orders are scrutinized quarterly or half-yearly. The Plant Additions Account is credited and the various Plant Accounts debited with the expenditure applicable to each which it is decided to capitalize.

The Collection and Distribution of Oncost Expense.

It may now be convenient to describe a little more fully how the departmental distribution of oncost expense is effected in the first instance. The nature of this expense has already been dealt with in considerable detail, and classified under the main service groups, such as Buildings Expense, Power Expense, and Stores Expense or Service.

We have also seen that standing orders are a means to secure direct allocation of all expense to departments, where such expense can be directly identified with the activities of separate departments, so reducing to a minimum the expense which has to be apportioned on more or less arbitrary lines.

The Oncost Journal.

The periodical collection and distribution of oncost expense is readily made and conveniently focused through

the medium of an Oncost Journal. This Journal may take various forms, but the most convenient, perhaps, is a columnar Journal. An illustration of an Oncost Journal will be found on the next page. In a Journal of this kind the classifications of expense are enumerated. The debit columns of the Journal are equal in number to the separate departments of the business, whether Service or Producing Departments.

A standing order cost schedule is kept for each classification of expense. This schedule receives in separate columns the allocations of stores and wages, and also expenditure of other kinds from the Works Expense columns of the Purchase Journal and Cash Book. The columns of these schedules are totalled periodically and the totals transferred to the debit columns of the Oncost Journal.

The credit columns of the Journal receive the credits corresponding to the debits just described. The columns are sufficient in number to provide for the analysis of these credits. By this analysis, all credits to stores appear in one column, credits to wages appear in another. credits to "Works Expense," Depreciation, and to Rent appear in others.

If, for instance, we take the item Repairs to Building, expenditure under this head will probably be in the form of material issued from stores, and wages. By the operation of the standing order method, this expenditure is charged to each department concerned. These departmental charges are summarized on the debit side of the Journal, on the line reserved for Repairs to Buildings, and the corresponding credits will appear on the credit side, under the heading of Stores Account and Wages Account.

The total of the credits in the Stores column will therefore agree with the total Stores requisitions on Standing Orders for the period.

**SUMMARY OF DEPARTMENTAL ONCOST EXPENSE FOR
4 WEEKS TO 4TH SEPTEMBER, 19..**

	Producing Departments.			
	Total.	No. 1.	No. 2.	No. 3.
	£	£	£	£
Building Expense	603	131	221	251
Power Expense	415	200	50	165
Supervision	20½	50	73	79
Stores Service	19½	27	23	145
<hr/>				
Expense of Producing Plant and Machinery, viz.—				
Repairs	186	60	40	86
Depreciation	200	50	75	75
Cleaning and Sundries	50	10	25	15
	1851	528	507	816

The total of the credits to wages will agree with the total wages allocations to Standing Orders.

The total of each of the credit columns may be posted to the credit of the Ledger Account concerned. The total of stores issues charged to departmental overheads will be credited to the Stores Control Account ; the total rents to the Rent Account ; and so with each account for which a credit column is needed in the Journal.

The only Ledger Accounts necessary are those corresponding to the main sources of expense appearing on the credit side of the Journal. Although the debit side of the Journal may contain many debits for stores issued to different departments and to different expense classifications, all these debits are collected in the Stores column on the credit side of the Journal. The total of this column represents, therefore, a single credit to the Stores Control Account, corresponding to these debits.

This also applies to wages.

It also applies to factory expenditure not represented by stores or wages, which is collected together in the

"Purchase Journal, or in the Cash Book in the first instance, in the column headed "Works Expense."

The total debits to each department as shown on the debit side of the Oncost Journal are dealt with as follows. The total debits to Service Departments, such as Stores Service, or Power Service, are first of all allocated, on some agreed basis, to the Producing Departments. These allocations are added to the totals of the columns of the Producing Departments. The total oncost expense of each producing department thus ascertained, is posted to the Departmental Oncost Account in the Ledger. It may also be summarized from the Oncost Journal into the very convenient form shown on the previous page.

It will be seen, therefore, that the number of essential Ledger Accounts is small, the necessary segregation of expense being made through the medium of the Oncost Journal, and exhibited more clearly than it would be through the listing of separate Ledger Accounts for each expense classification.

Apportioning Expense not Directly Identified with Particular Departments.

There are important classes of expense which cannot be directly identified with the activities of separate departments. Means have therefore to be devised for the apportionment of these classes of expense to each department. It may be well to indicate the bases commonly adopted.

In the case of rent and rates, the monthly or other periodical charge under this head would be ascertained, and apportioned to each department according to the estimated value of the space occupied by the department.

Insurance of buildings would be apportioned according to the value of the departmental premises.

Other items of expense, however, are more difficult to apportion, and the bases to be adopted must depend very

much upon the circumstances of each case. The direct allocation of expense to departments through the medium of standing orders is of the utmost importance, because, as already stated, the expense which has to be apportioned on more or less arbitrary lines is thereby reduced to a minimum.

Depreciation and insurance of machinery will be apportioned to departments on the basis of the nature and value of the equipment of each department.

Building repairs will be charged to departments entirely through the medium of standing orders.

Repairs to machinery are charged in the same way.

Cleaning of machinery will be charged to departments, also through the medium of standing orders.

The allocation of stores expense requires to be carefully considered. The cost of transporting goods either by trucks or by overhead cranes is sometimes included in the stores service. The method of apportioning this expense is very frequently based upon the factory cost, including the cost of material used. The expense is therefore not charged to departments, but, together with general administration or establishment expense, is allocated to orders in proportion to the total factory cost.

It cannot be said that this method is always conducive to accuracy. If we analyse the nature of the stores service, we shall see that the value of materials is not by any means necessarily a measure of the expense of store-keeping. Material which is quite costly may take up very little room in the stores, and may be requisitioned at comparatively infrequent intervals. If, however, we adopt material value as the basis for the allocation of stores expense, such material will bear this expense out of proportion to the actual expense incurred in storing it.

This is also the case with material which requires to be handled by means of cranes. Such material is sometimes costly and sometimes comparatively inexpensive, and the

allocation of stores expense on the basis of value would lead, therefore, to inaccurate results.

In allocating stores expense to departments, therefore, regard should be had to the nature of the services rendered by the stores, and the nature of the material used, in each department. The number of requisitions made upon the stores by each department is important in this connection. Where also particular machines are served by an overhead crane system, these machines should be treated as a separate department, to which the expense of the crane service should be allocated.

Where the machine rate is in use, such a difficulty as the distribution of crane expense is more equitably disposed of than it is where other methods of applying oncost are adopted.

Power expense is allocated in several ways. The actual cost of current, or of gas or steam power, is charged either by actual measurement, or on the basis of the estimates of the engineer or some other responsible person competent to supply them.

Repairs to power plant equipment, so far as they relate to equipment outside the power house and inside departments, are directly allocated through standing orders.

Lighting and heating is sometimes derived from the power house, also, and where expense under this head is sufficiently important to make its separation from the power consumed advisable, this should be done. The lighting expense of departments varies very greatly in some businesses. Stores such as gas mantles or arc lamps, arc lamp carbons, and other kinds of electric lamps would be charged direct to the departments consuming these stores, through the medium of standing orders.

Supervision includes various administrative salaries and proportions of salaries, and its allocation to departments is frequently a matter of some difficulty. A very common method is to apportion this expense, together with

the expense of the factory offices, such as the Cost Office and Wages Office, on the basis of the direct labour expenditure incurred in each department. This method, however, is frequently open to objection. The direct labour expenditure is not always a fair index of the supervision and management entailed by each department. Regard should therefore be had to the nature of the departments before this method is adopted. It is useless to adopt a standard of measure merely for its own sake, and departmentalization on arbitrary lines, which has regard to the peculiar circumstances of each case will often give more accurate results than the adoption of a more or less fanciful method based on some supposed arithmetical relation of one kind of expense to another. In making these departmental allocations, what is required is intimate knowledge of the work performed by each department and sense of proportion.

Calculation of Machine-hour Rates.

The particular merit of the machine-hour method of allocating oncost is that it makes possible the grouping of machines of similar type and power and of similar value. That is to say, it makes possible the isolation of parts of the manufacturing equipment, in which conditions are more or less uniform. This is the essential feature of correct departmentalization, and the definition of a department from this standpoint is somewhat different from popular ideas of what departments are.

The adoption of the machine-hour method, in fact, often means the multiplication of departments, and where one machine is dissimilar in capital value and in cost of running from all other machines it forms a department by itself.

In order to ascertain machine rates for particular machines, or groups of machines, it is necessary to prepare a schedule of machines. The capital value should then be

set against each machine, together with the rate of depreciation applicable. An estimate should also be made of the cost per hour of the power consumed by each machine, distributing the total cost of power in this way.

The rent charge should be calculated on the basis of the space occupied by each machine, care being taken to dispose of the whole rent and rates of each shop over the machines in the shop.

The cost of lighting and heating should be dealt with in a similar way, where this expense is important enough to separate from the general power expense.

The cost of tools should also be charged to each machine, or group of machines, in accordance with the tools used, details of this expense being collected through the medium of standing orders.

The number of working hours for each machine is then estimated, and an hourly machine rate calculated from these particulars.

We obtain in this way a concentration of direct allocation charges to identical or practically identical producing machines, and thereby ensure a degree of accuracy, where machines are dissimilar in type, which is possible by no other method. •

There will still remain, however, expense which will require allocation on more or less arbitrary lines. Methods of effecting this allocation have already been described and repetition is therefore unnecessary.

CHAPTER XIII

MODIFICATIONS of Idealistic Methods to Suit Certain Conditions—
The Treatment of Losses through Spoilage—The Treatment of
Scrap—By-Products—The Uses of Costs for Administrative
Control—Conclusion.

Modification of Idealistic Methods.

A BRIEF review of practical Costing methods has now been given. The methods described are idealistic, and are not applicable in their entirety to all classes of manufacturing business. That is to say, the precision which we have throughout insisted upon cannot always be maintained.

Continuous records of stores values as well as quantities are not always worth the cost of maintaining them. They are not always necessary. In some industries, the precise distribution and control of stores values which have been outlined, are impossible.

The allocation of timber values, for instance, is a matter of some difficulty. A large quantity of timber may be purchased at a certain price. This timber varies in width and length, and, to some extent, in quality. The waste which occurs is variable. The variation is not only due to the causes mentioned, but also to the nature of the work for which the timber may be required.

In allocating timber to costs, therefore, reserves are made to cover wastage. These reserves may fall short of or exceed the reserve which is necessary, according to the quality of the purchases. It is impracticable, therefore, to ascertain stock values by accounting processes, except approximately. Periodical stocktaking will reveal the aggregate effect of the variations. It will then be known whether the allocations of timber to individual costs during the period have fallen short of or exceeded the cost value of timber consumed. This is information

which the ordinary form of accounts does not supply, but it often conveys very useful lessons.

The preparation of separate costs for every production order issued to the factory may also sometimes be considered unnecessary, particularly where there are repetitions of orders recently executed. Sometimes, therefore, the original cost computations are used for the purpose of clearing Work in Progress Account of the cost value of such orders when finished. As the actual cost may differ from this substituted cost, the Work in Progress Account is not cleared with exactitude by this method, and the balance will not therefore represent the exact cost value of work in progress from time to time. If, however, the basis of stock valuation is factory cost, the approximate extent of the difference between the actual cost value and the book value of work in progress will be ascertained at stocktaking.

None of these conditions, however, should modify the general form of the Manufacturing Account. This form is almost always applicable.

At periodical stocktaking three discrepancies may be revealed, two of which are due to the conditions just described.

(1) The valuation of materials in store will differ from the valuation ascertained by accounting processes.

(2) The work in progress as valued at stocktaking will differ from the value as shown by the books.

(3) The overhead expense distributed to costs will differ from the actual ascertained overhead expense.

Important lessons may be drawn from the state of these three accounts, which reveal information not obtainable from the common form of Trading and Profit and Loss Accounts.

Trading transactions, broadly speaking, consist of the transfer of values, and these three accounts show, in the circumstances indicated, the aggregate effect of errors which have arisen in the estimates of those values.

Treatment of Losses through Spoilage.

Various difficulties arise in Costing, chiefly in the allocation of materials to orders, which may now be considered briefly. Losses incurred through waste of material and through spoilt work vary in importance in different industries, and also in different departments of the same business.

The methods generally adopted to meet these difficulties cannot be considered very satisfactory. First of all, let us consider the waste of material due to defects in the material itself. These defects are likely to reveal themselves at any stage of the manufacturing processes to which the material is being subjected, and the loss is therefore of an uncertain character, involving loss not only of material, but of labour and expense.

In some industries, these losses are only small in relation to the total expenditure of the factory. In such cases it is considered sufficient to regard them as one of the inevitable expenses to be spread over the whole output in the general allocation of the factory burden. This simple method involves merely the adding together of these total losses in order to ascertain the value of the wasted material, and labour to be distributed in this way.

In other cases, however, the distribution of this expense in so general a way would not be satisfactory.

For instance, let us take again the case of a steel ingot. A heavy steel ingot is of great value, and the proportion of wasted material due to defects in the ingot depends very largely upon the use to which the ingot is put, and to the requirements laid down by the purchasers of articles of which a steel ingot is the raw material.

Suppose, for instance, a shipbuilder places an order for a dozen propeller shafts. For ships of large size a propeller shaft is very costly, and in its manufacture the value of the material and labour which may be destroyed either through defective steel or faulty workmanship is therefore considerable. The risk of rejection, either for these

reasons or for other reasons, is increased by the stringency of the tests which may be imposed by the shipbuilder upon the manufacture of these shafts. It is advisable, therefore, for a manufacturer who undertakes work of this character to keep a careful record of the total cost involved.

Suppose in the process of manufacturing twelve propeller shafts, one forging was found defective through some flaw in the material itself, and another was spoilt in the process of machining. The best course in these two cases would be to serve a requisition for another forging, in place of the defective forging, charging the cost to the particular "job" order for the original twelve shafts, and crediting the "job" with the value of the defective forging. If this forging were supplied by an outside maker, the defective forging would possibly be replaced free of cost, in which case no loss would arise, except the loss of wasted labour.

In the case of the forging spoilt in process of machining, it is advisable to issue a requisition for another forging and also to issue a supplementary works order for the operations which have to be repeated, in consequence of the accident to the original shaft. The cost of the second forging, and of the second operation, or series of operations, would be charged to the original "job" and the scrap or other value of the spoilt shaft credited.

In this way each "job" bears its own losses, the costs being thereby increased, and the question whether these losses fall upon the seller or the purchaser will depend upon the nature of the contract. The necessity for this method is emphasized by the fact that a contract for the supply of forgings of this large size may take two forms. The contract may be placed at a price at which the purchaser takes all risks of rejections, or at an enhanced price at which the supplier takes these risks.

The same forms of contract may also apply to the machining of a propeller shaft from the rough forging.

A shipbuilder who found it necessary to purchase three forgings to produce two propeller shafts would charge the cost of these, less the value of the forgings rejected, to the ship, and according to the terms of the contract he may be able to recover this expense from the purchaser of the ship.

Wherever possible, these methods of recording spoilt work might advantageously be followed. Although it may not always be advisable to include the cost of replacing defective material or spoilt material in the total cost of any order, yet a record showing the separate cost in relation to any particular "job" is frequently very valuable to the management. By the use of distinctive forms for such contingencies, the total cost of this expense for any period may be ascertained, and its allocation to the various departments determined.

In addition to this, however, the direct allocation to separate "jobs," as already described, frequently leads to a more equitable distribution of this expense. Attention is sometimes drawn in this way to the fact that special risks belong to particular operations, and statistics showing the extent of that risk in successive periods will sometimes lead to the introduction of methods of reducing the risk itself.

Treatment of Scrap.

The question of the treatment of scrap material is closely connected with what we have just discussed. In manufacturing operations, scrap material is frequently produced, such as turnings or borings. The treatment of turnings and borings must also depend upon the nature of the industry.

In the cases we have mentioned, where large steel forgings are machined, and perhaps bored, it is the practice to credit the scrap value by a system of measurement. The approximate size of the original forging is laid down in

the specification, and the size of the boring is also ascertained from the drawings, as well as the outside measurement of the completed production. The weight of the original forging being known and the proportion machined away being ascertained by a simple arithmetical process, the approximate weight of turnings and borings, and other parts which are possibly cut off from the solid piece, is quickly calculated. After making allowance for losses in collecting, this estimated weight is credited to the cost of the particular "job." By charging these total credits to Scrap Material Account, and crediting it from time to time with the amount of scrap disposed of, the proper distribution of scrap values is kept well in control, and any discrepancy arising between scrap collected and scrap credited to individual costs is revealed.

Where articles are manufactured from uniform material the practice of crediting the difference between the average weight of the raw material and the finished weight is fairly common, and, where it is at all practicable, it appears to be a satisfactory method of dealing with an otherwise difficult matter.

Many manufacturers, however, particularly of smaller articles, ignore scrap values altogether, the realized value of this scrap metal being credited to the Profit and Loss Account, and not reckoned in calculating manufacturing costs.

There are others who spread the realized value uniformly over the total factory output. This is a very crude method, obviously inequitable, but perhaps a little better than the practice of ignoring this factor altogether.

By-Products.

Special difficulties arise, also, when manufacturing processes yield by-products which themselves form the raw material for other manufacturing processes. An illustration of this difficulty, frequently met with, is where metal

discs are stamped out of sheet metal, leaving scrap-sheet having a definite market value, which is utilized for the cutting out of smaller discs. If it were definitely known that the whole of the scrap from the stamping of the large discs would be utilized for the stamping of smaller discs, that all this scrap would be utilized in this way, and that the stamping of small discs out of new sheet metal would never be necessary, the problem would be considerably simplified. When, however, the whole of the scrap is not so utilized, or new sheet metal as well as the scrap is used for the smaller discs, the problem of fixing the cost value of small and large discs becomes rather difficult.

As a matter of fact, problems like these arise in almost every business. Take, for instance, the case of a steel ingot weighing 80 tons, first of all utilized for the production of a forging for a contractor who stipulates that this forging shall be made out of the middle of the ingot only and that a certain percentage of the top and bottom portions shall not be used. An 80-ton ingot might produce 9 or 10 forgings of different grades. Some would be made out of the top and bottom parts, and others out of the parts cut off in the process of forging the articles for which the middle only had to be used.

It is impossible, of course, to get at the true cost of the top and bottom part of the ingot as distinct from the ingot as a whole, just as it is impossible to ascertain the separate costs of wool, hide, and mutton in connection with sheep-rearing.

The problem which has to be decided is the proportion of the total cost of the original ingot which should be charged to every forging produced from that ingot. No general rule can be laid down, and the essence of the problem is similar to the case of the metal discs. These problems go to show that the ascertainment of true costs is frequently quite impossible, the only course open being

an approximation which will reflect the actual conditions as accurately as possible. In the interpretation of these conditions there is room for differences of opinion.

Uses of Costs for Administrative Control.

Attention is again drawn to the usefulness of office machinery in connection with Costing operations. Costs, if they are to be valuable, must be produced with promptitude. With the aid of mechanical devices, it is possible now to achieve at relatively small cost what was considered a few years ago to be practically impossible. Much depends upon method in the collection of Costing details. Where the methods are efficient, the production of costs will be secured with relatively little outlay, and their usefulness in the administration of business will far outweigh the expenditure incurred to this end.

In conclusion it may be said that the periodical statement of factory operations, as thus described, forms an index to the administrative body, of the efficiency of the factory.

The whole expense of manufacture is there exhibited in such a manner as to ensure the maximum degree of control through the medium of expenditure. It exhibits also the precise form which this expenditure has taken during the period covered by the statement. It shows what amount is invested in raw material, what amount is represented by work in progress of manufacture, what amount has been converted into finished goods ready for sale, and the total cost of finished goods remaining unsold. All this is information not usually obtainable at frequent intervals by ordinary accounting methods. In the majority of instances it is never obtainable at all in the precisely clear form which the accounting methods we have outlined make possible.

The value of the cost department to the administration is the measure of its efficiency. No department should be

more carefully organized than this one, no ideals more exalted, and no balances more stable than those which it creates and adjusts.

In the past this pulse-feeling department has been sadly neglected, but in days of high competition the Cost Accountant will come into his rightful inheritance.

Already there is abundant evidence that the need for him is felt. It will be felt more and more as time passes. It is the object of this short treatise to point out the great value of efficient Costing in Trade and Commerce. It is also hoped that the Cost Accountant may be assisted by it to equip himself so that he may render efficient service, and perform the duties involved with integrity and honour.

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